INFORMATION NEEDS OF RURAL FARMERS IN KEDAH: A CASE STUDY OF PUSAT INTERNET DESA (PID)

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Abstrak

Pencapaian kepada maklumat yang tepat, sesuai dan boleh dipercayai memainkan peranan yang penting dalam meningkatkan pengetahuan dan kemahiran masyarakat di luar bandar. Kajian yang lepas kurang memberi tumpuan kepada laman web yang merangkum keperluan para petani di luar bandar. Tujuan kajian ini adalah untuk menentukan keperluan maklumat petani luar bandar melalui PID di Kedah, Malaysia. Untuk tujuan ini, teori membuat pertimbangan oleh Dervin telah digunakan sebagai panduan. Maklumat yang diperlukan oleh petani telah di masukkan ke dalam laman web yang sesuai menggunakan dwi bahasa iaitu Bahasa Melayu dan Bahasa Inggeris, laman web ini akan digunakan oleh petani di Kedah dalam menguruskan pertanian mereka. Seramai 200 orang petani di Kedah dari kedua-dua jantina telah di ambil sebagai sampel kajian tetapi hanya data dari 187 orang responden digunakan untuk analisis. Teknik persampelan rawak digunakan untuk pemilihan sampel manakala soal selidik digunakan bagi mendapatkan maklumat daripada responden. SPSS versi 20 telah digunakan untuk analisis data, dan data tersebut dianalisis dalam pendekatan kuantitatif. Keputusan kajian menunjukkan bahawa keperluan maklumat yang tertinggi adalah berkait dengan kemudahan kewangan, pemasaran pertanian, dan pengurusan serangga perosak. Umur, pendidikan tertinggi dan hubungkait dengan ICT telah menunjukkan hubungan yang signifikan dengan kebolehan pencapaian maklumat. Adalah dicadangkan bahawa maklumat yang secukupnya seharusnya disediakan di kawasan yang diperlukan dan program pemerkasaan ekonomi perlu diberi perhatian yang serius bagi meningkatkan pencapaian maklumat yang diperlukan. Seramai tiga puluh orang petani dari kawasan yang berbeza di Kedah telah dipilih untuk menguji kebolehgunaan laman web (INRFK). Keputusan umum menunjukkan laman web INRFK memberi kepuasan dalam keperluan mereka dengan menyediakan maklumat yang tepat.

Katakunci: Keperluan maklumat , Sumber maklumat, Petani Luar Bandar, Telecentre, PID.

Abstract

Access to accurate, appropriate and reliable information plays a crucial role in improving the rural community's knowledge and skills. Previous studies have little focus on website that embeds the rural farmers' information needs. This study aims to determine the rural farmer's information needs, through the PID of Kedah State, Malaysia. For this purpose, Dervin's sense making theory was utilized as a guideline. The farmer's needed information was embedding into a suitable website in two languages, namely local (Malay) and English language, this website would serve the rural farmers in Kedah by managing their farming. A sample size of 200 rural farmers from both genders in Kedah was initially taken to determine their information needs, but the usable data was only 187 respondents were analyzed. Simple random sampling technique was used for the sample selection as well as using of the questionnaire to elicit information from the respondents. SPSS version 20 was used for data analysis, and the data was analyzed in quantitatively approach. The results revealed that the highest information needs were related to the areas of financial facilities, agriculture marketing and pest management. Age, level of education and connectivity to ICT showed significant relationships with their accessibility to information. It is recommended that enough information should be provided in the needed areas and economic empowerment programs should be given serious attention to enhance their access to the needed information. Thirty farmers from different areas of Kedah were chosen to test the usability of the (INRFK) website. General findings revealed that INRFK website satisfied their needs by providing proper information.

Keywords: Information needs, Information source, Rural farmers, Telecentre, PID.

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

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Husam Abdulhameed Hussein

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List of Abbreviations

INRFK	Information Needs of Rural Farmers in Kedah.
ICT	Information and Communication Technology.
BDD	Bridging the Digital Divide.
PID	Pusat Internet Desa.
RIC	Rural Internet Centre.
MID	Medan Info Desa.
UN	United Nations.
IT	Information Technology.
ASK	Anomalous State of Knowledge.
PCs	Personal Computers.
MICC	Ministry of Information Communication and Culture.
TC	Telecentre.
PHP	Personal Home Page.
SPSS	Statistical Package for the Social Sciences.
HCI	Human Computer Interaction.
UE	Usability Evaluation.
UI	User Interface
MEWC	Ministry of Energy, Water and Communication.
MSD	Maju Sedunia Digital.
FTC	Federal Territories Currently.

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CHAPTER ONE

1.1 Introduction

This chapter contains the general overview and concept of the study. Firstly, the chapter provides an introduction about the background of the study. It presents the statement of problem, research questions and objectives, significance and scope of the study, and finally the chapter's summary.

1.2 Background

Moomal and Masrom (2015) states that the world is currently in such a situation where Information and Communication Technology (ICT) has diffused into nearly the entire human activities. There has been an expansion in the extensive proliferation of ICT technologies within the last twenty years, thereby causing the latest skill achievement and up-to-date commercial discovery (Heshmati, Al Hammadany, & Mohammed, 2013). According to Meng, Samah and Omar (2013), ICT usage may have a progressive influence on commercial improvement, learning, information dissemination and transportation as well as to enabling prospects for constructive improvement. For example, Malaysia is one of the emerging nations that has been stimulated by the positive results of ICT implementations in nearly all industrialized nations, and then has embraced ICT as portion of its federal development policies (Meng et al., 2013).

Dogara (2011) also argues that the extent of a country's development is determined by the level of its citizens' accessibility to ICT. As a result, presently, community ICT

centers universally known as Telecentres (TC) have sprang up in the majority of the developing nations (Bashir et al., 2011). Additionally, Olukayode et al. (2014) state that ICT is known as a powerful tool that assists organizations to participate in both national and international markets through promoting accountability, improving the service delivery and enhancing opportunity's development. The ways of investing in ICT have been increased in order to improve the output of the organization in almost all the countries in the emerging world. Consequently, an essential mechanism is required to confirm that ICT investments and operations are adequate, effective and efficient in the rural areas for business purposes (Olukayode et al., 2014).

In (2008), Huenerfauth states that to combat the growth of the digital divide in the 1990s, many international organizations funded efforts to expand the reach of information technology, to developing communities who otherwise might not have been able to afford such access. The major way that has been undertaken by the International Telecommunications Union, the United Nations, the World Bank, and other groups to counteract this problem is to establish "telecentres" which refer to small office-like spaces with telephones, computers, and a good Internet connection in developing communities throughout the world.

The usage of internet in Malaysia began around 1992 (Salman & Hasim, 2009). Consequently, Malaysia government planned to utilize Bridging the Digital Divide (BDD) as a basic policy trend so as to realize the benefits of knowledge-based economy for all Malaysians. Strategies had included the implementation of the infrastructure plan for universal access as well as making ICT products and services more available and

affordable (Harris, Yogeesvaran, & Lee, 2007). Among the strategies were to establish telecentres in rural areas and distribute netbooks with broadband access to students from low-income families (Meng et al., 2013). These initiatives eventually caused and increased the spread of internet service in the neighborhoods. As for the telecentre initiative, 42 Pusat Internet Desa (PID) or Rural Internet Centre (RIC) were established for rural societies to expand their economic and social welfare as well as to improve computer education and facilitate the access and use of information (Harris et al., 2007; Nor, Razak, & Malek, 2012).

In 2010, about 40 Rural Internet Centers (RICs) or Pusat Internet Desa (PID) were fully operated in Malaysia with their own websites and members' networks. The telecentre project initiated in April 2000 stands as one of the government's initiatives to bridge the rural-urban digital divide through free community shared ICT facilities and internet access. Rural communities need to stay abreast not only of technological advances but of the country's development and the government plans (Alias, Jamaludin, Hashim, Ismail, & Suhaili, 2010). Nevertheless, programs must be relevant to the specific via native language use to offer maximum advantage to a rural society. Centers of Information and Communication Technology (ICT), like PID and "Medan Info Desa" (MID) in rural area, can provide constant coverage of internet and thus lessen the digital divide (Samsuddin et al., 2015).

As stated by Kabir (2015), in India and Sri Lanka, the initiated services of rural telephone and community radio had been successfully recognized by farmer communities. AbdulWahab (2012) stated that the improvement in technological

invention has not yet brought an extraordinary change to the standard of living in the rural neighborhood of the developing nations; however, the highest percentage of the population reside in the rural areas as well as these groups of people do not have the potential to derive the advantages from the latest ICTs.

Technological transformation is the complete procedure involving constant creation, invention and distribution of technology with the goal of bringing about advancement in the value of practical functioning. According to Zahurin et al. (2010), the ICT usage among rural communities can be promoted through community telecentres. During the past decade, these community telecentres have been rapidly promoted as a vehicle to provide access to information especially for rural communities in developing countries.

In the developing countries, telecentres are now broadly responsible for the improvement of consciousness in politics and administration, socio-economic, tradition, learning as well as control in the rural areas. In this sense, telecentres refer to a place or location dedicated to ICT for people in the rural areas so as to get information and skills as well as serving as location of all time educational undertakings for the rural communities to obtain official and unofficial learning (Jalaluddin, Abdul, Mohd, & Alfitri, 2014). Bailey (2009) argues that the function of telecentre is to facilitate sending and receiving of messages involving government and the people which is among the goals that government representatives highlighted after observing that upgrading the country's ranking in the United Nations (UN) world e-government evaluation is essential. Certainly, telecentres provide prospects and advantages to rural people for

improvement in diverse fields like medical, learning, farming, business and economy, as there are minimal internet accessibility in the household (Buhigiro, 2013).

According to Rao (2004), the information is the key to democracy that with the advent of Information Technology (IT) it has become possible for the common man to access global information. The information is generally defined to include oral communication, voice in telephony, text in fax and newspapers, images in video and television broadcasting, and data in computers. The information needs can be classified according to the "agricultural cycle" or the "agricultural value chain" (Ali & Kumar, 2011; Mittal, Gandhi, & Tripathi, 2010; Silva & Ratnadiwakara, 2008). Both approaches work through the different phases of decision making that a farmer faces during a cropping season which include acquisition of inputs, production planning, cultivation, harvesting, packing and storing, transportation, and selling (Babu, Glendenning, Okyere, & Govindarajan, 2012).

The variety of rural societies and states improvement suggest their multi-dimensional and numerous needs of information. It is crucial to define their overall information needs (Harande, 2009; Meitei & Devi, 2009). Along with Lwoga's (2009) description, information need represents individual's knowledge gap in cases of sense-making, or an Anomalous State of Knowledge (ASK). Information need is recognized as the inadequacy of personal knowledge in satisfying the intended goal. Nonetheless, the similar needed information level may vary among persons or even groups of persons depending on various factors, including: demographic factors of education, age, socio-

economic background, or resource-based factors, i.e. availability, availability awareness, association, and resources accessibility.

Dutta (2004) claims that the farmers normally need information about weather forecasts, availability of agricultural loans, new varieties of seeds, new methods of using fertilizers and so on. However, it is very important that the information needs can be recognized by the information seeker him/herself or by the information expert on behalf of the information seeker. Both information seeker and expert may need to work together towards "disentangling" and establishing the actual information. Information needs are thus a requirement that may drive farmers into an information seeking process to fulfill their information and knowledge gaps (Lwoga, 2009).

1.3 Problem Statement

A lot of investigators have stated that farmers usually are not only unaware of the best cultivation techniques but also has been exploited by middlemen who do not offer fair prices (Doshi & Gollakota, 2011; Heeks, 2002). Ramli et al. (2015) argues that farmers face different obstacles such as guaranteed access to market, information and market infrastructure which, in turn, lead to the reduction of agricultural activities. Poor information management especially on the recent market prices, is another difficulty encountered by modern farmers (Ramli et al., 2015). Moreover, farmers in the rural areas have insufficient information regarding the local requirements and lack of scientific knowledge in relation to farm which will eventually contribute to the steady decline in crop production (Azarian, Hassan, & Abu Samah, 2012).

Studies have revealed that the evolution of web can be related to the system which provides support for the needs of the users in terms of content usage (Bevacqua, Carnuccio, Ortale, & Ritacco, 2011). The success of web content becomes a reality with the transition of Web 2.0 to Web 3.0 which is capable of accommodating the large volume content for the individual usage (Haubold & Natsev, 2008). This implies that millions of people derive tremendous advantages through the ability to access Information and Communication Technologies (ICT). Moreover, the study of Duquennoy, Grimaud and Vandewalle (2009) has stressed that web server is purposely created to allow access to content holds by web application for the use of individual. This usually can be accessed in a dedicated telecentre which are commonly found in the rural and sub urban areas.

According to Hedberg (2011), there is only a small number of agricultural-related websites in Bahasa Malaysia. Since they are not well versed in English, most of the rural farmers in Malaysia were not comfortable to access information from the websites. Therefore, the main role of the telecentre is to provide more web contents in Bahasa Malaysia. This is required to ensure that the objective towards enriching and community development (Meng et al., 2013), especially the rural farmers. Yet, the rural farmers still encounter difficulties in gaining their needed information because of the limited technological skills, language barrier, and limitation in the relevant content (Kanhabua, Niederée, & Siberski, 2013; Kirk & Sellen, 2010).

The application of sense making theory along with the information model in relation to the rural farmers serves the originality of this research. In 1998, Dervin has introduced

the sense making theory which focuses on the information phases needed in forming a structured system as well as revealing how to embed the data or information in the designed prototype. Due to being a guidance when dealing with the needed information to be embedded in a suitable prototype model used by rural farmers (Dervin, 1998); therefore, the use of sense making theory enabled the researcher to collect data from rural farmers besides achieving important objectives for them.

Earlier study by Cheang and Lee (2010) argued that the success of telecentres among rural farmers is yet to be achieved due to the failure of providing the rural farmers needs on the ICT application that supposed to be accessed by the facilities of telecentres. The farmers are still having lack of access to information (Garrido, Sey, Hart, & Santana, 2012). Previous studies of Doshi and Gollakota (2011); Huang et al. (2008) stressed that there is a little attention paid to web contents that embeds the rural farmers' needed information. Therefore, this study is aimed at addressing these issues by determining the information needs of the rural farmers and embedding them in a suitable website with different languages Malay and English.

1.4 Research Questions

The research questions are as follows:

1- What are the information needs of the rural farmers?

2- How do the information needs of the rural farmers be represented as a prototype?

3- Does the prototype represent the information needs of the rural farmers?

1.5 Research Objectives

The objectives of this study are:

1- To determine the information needs of the rural farmers.

2- To develop a prototype based on the information needs obtained from the first objective.

3- To evaluate the information needs based on the developed prototype.

1.6 Significance of the Study

This study improves the information services for the rural community by improving the farmers' awareness of and capacity for using the information service. The improved rural information serves to make a vital contribution to Malaysia rural economic and social development. That will contribute much to the effective use of telecentre and their vocation which is mostly a rise in productivity, income and purchasing power.

1.7 Scope of the Study

The study aims at identifying the information requirement for the rural farmers in Kedah state, Malaysia. In this research, the focus will be on the Rural Internet Centre (RIC) or Pusat Internet Desa (PID) that are established for rural communities. There are four (PID) in various villages of Kedah, including: Bukit Kayu Hitam, Kuala Nerang, Yan and Kupang. Questionnaire copies were distributed to the rural farmers from both gender (Male and Female), who are already used the (PID) in their activities, to collect the data from several rural farmers through Pusat Internet Desa.

1.8 Summary

This study provided a description of rural farmers' information needs in Kedah, Malaysia. This chapter introduced the research problem, its objectives and questions, its scope and significance, as well as the organization of other chapters in the current study. Hence, Chapter 2 dealt with the literature reviews concerning the information model of the rural farmers, the concept of telecentre, and the sense making theory used as the guiding framework in this study. Chapter 3 described the methodology used in this study and proposed the conceptual model/framework. In Chapter 4, the data analysis and findings were addressed by describing the importance of the information systematically. The prototype implementation and evaluation in relation to rural farmers' information needs presented in Chapter 5. Finally, Chapter 6 discussed the conclusion and recommendation of this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The rapid technological revolution has empowered various communities in the area of the utilization and access to the tools of Information and Communication Technologies (ICTs) through telecentre based on the assumptions of its economic transformational ability (Bashir et al., 2011). However, the emergence of new technologies has influenced the usage of ICTs positively and negatively.

2.2 Rural Farmers' Information Needs

Societal needs are satisfied through various kinds of services, each of which requires information as an input. Information is considered as a key source for both urban and rural residents in the development phase. The nation's capability to acquire, produce, access and use of relevant information form the basis of achieving its goals of wealth, growth, and development (Mtega & Ronald, 2013). Dey, Prendergast, and Newman (2008) carried out a study claiming that the addition of agricultural value involves changes in the technical, organizational and price incentive aspects which are planned to elevate farms' productivity.

Socio-economic development of rural farmers requires various types of information such as those related to political, marketing, leisure, business, livestock husbandry, news, health, food and nutritional, environment, and religious (Mtega & Ronald, 2013).

Shaifuddin, Ahmad, Mokhtar, & Haliza (2009) added that health and job opportunities, rural developmental programs, academic knowledge, law-related, cattle farming, agricultural extension and advisory services are also important. Nevertheless, the information that is really required by the rural farmers may vary according to different challenges, issues and problems faced (Meitei & Devi, 2009).

The differences in the rural farmers' information needs may also due to the existence of three categories of the farming community which are small, medium and large scale farmers. Each category depends on the size of farm possessed by the farmers. Based on these categories of farmers, the information needs can be divided into six groups: field acquisition, agricultural input, agricultural technology, agricultural credit, agricultural marketing and food technology. For instance, Naveed and Anwar (2013) found that the Pakistani farmers from the large scale category required agro-technological related information in preparing seed, taking care of crops, and harvesting activities.

Apart from the above, Sharma (2014) indicated that the types of agricultural information required by the farmers in Madhya Pradesh state in India had been grouped under four broad categories, which include technical, marketing, social and legal. Among the issues related to technical were weather forecast, soil management, cropping system, food processing, crop storage, livestock feed formulation, livestock drug administration and machineries operation. The marketing information was those related to current and future marketing prices, market location, budgeting methods and credit source. The social information included cooperative associations, social welfare, personal education, specialized commodities, media club association, disaster relief, community self-help

and risk management while legal comprised of citizen rights, land tenure status, land dispute settlement, land lord/tenant agreement, export/import regulation, agriculture insurance, farming contact agreement and loan collateral procedures.

On the other hand, the farmers in the Delta state of Nigeria required information pertaining to the use of agro-chemicals and agronomic practices. Relating to the agro-chemicals, the farmers expressed strong desire for more information on the usage of herbicides and pesticides, whilst agronomic practices include on crop spacing recommendation, planting method, land preparation, cassava variety improvement as well as planting and harvesting timing (Omoregbee & Banmeke, 2014). Similarly, the Nigerian farmers in Adamawa preferred to access information related to agricultural activities, fertilizer availability, insecticides availability, storage methods, animal health, credit availability, prices of produce from other states, labour availability, and agriculture insurance policy (Elizabeth, 2007).

According to Akanda and Roknuzzaman (2012) farmers in the northern region of Bangladesh required information on seeds, diseases and pest, soil and water conservation, post-harvest technique, irrigation, manure and fertilizer management. Nevertheless, a large number of the farmers seek information occasionally on modern cultivation system, agricultural training programmes, weeding and thinning, agricultural government schemes, storage of crops, and weather information. The various rural farmers' information needs are summarized in Table 2.1.

Table 2.1

Rural farmers' information needs

Author	Year	State/Country	Rural farmers' information needs
(Mtega & Ronald)	2013	Tanzania	Political, marketing, leisure, business, livestock husbandry, news, health, food and nutritional, environment, and religious.
(Meitei & Devi)	2009	Manipur/ India	Agricultural, health, food and nutritional, environment, technological, educational and training, business and trade, govt. policies and plans.
(Shaifuddin et al.)	2009	Selangor/ Malaysia	Health and job opportunities, rural development program, academy, law, cattle farming, agricultural extension and advisory services.
(Naveed & Anwar)	2013	Pakistan	Soil/plot preparation, preparation of seeds, taking care of the crops, harvesting activities, and animal husbandry.
(Sharma)	2014	Madhya Pradesh/India	Technical information, marketing information, social information and legal information.
(Omoregbee & Banmeke)	2014	Delta/ Nigeria	Improved variety, land preparation, harvesting time, planting time, crop spacing, planting method, fertilizer application, weed control, and pesticides.
(Elizabeth)	2007	Adamawa/ Nigeria	Agricultural activities, fertilizer availability, insecticides availability, storage methods, animal health, credit availability, prices of produce from other states, labour availability, and agriculture insurance policy.

(Akanda & Roknuzzaman)	2012	Bangladesh	Modern cultivation system, seeds and planting materials, diseases and pest management, manure and fertilizer management, soil and water conservation, government schemes on agriculture, harvest techniques and market information.

2.2.1 Information Sources in Rural Areas

Information accessibility for rural residents requires proper sources of information. Those sources can be framed individually and organizationally, and formed either as a soft or hard copy. Sources of information are divided into internal and external sources. Sources that are emerged from inside of an organization or society are called internal, whereas sources that emerge outside of that frame are known as external. In most cases, both types of information sources are prevailing (Mtega & Ronald, 2013). For example, rural communities usually depend on various sources of information such as through social group gatherings, religious leaders, women's meeting, livestock headers, researchers, observations, churches and mosques, notice board and seminars. In terms of the agricultural-related information, the communities may select whatever alternatives those are relevant to them. Mtega & Ronald (2013) also indicated that the agricultural information sources are relatively identical throughout the country.

In another study, Lwoga (2009) suggested that the rural societies access and utilize agricultural information through villages leaders, agricultural extension officers, neighbors and friends, family/parents, radio, TV and internet. Other related information

sources include books, brochures, films, leaflets, newspapers, magazines, non-governmental organizations, farmers groups, personal experience, agricultural inputs supplier, posters and agricultural shows.

As for the case of Malaysia, women had been acknowledged as the key persons to mobilize resources for national interest due to their active participation in the development of the nation. This had been practiced ever since 1991 when the Malaysian government provided a chapter on Women and Development in its five-year development plans (Bakar, 2011). The results of this research revealed that the mass media categories which are represented by newspapers, magazines, television and radio symbolize were the most preferred and important sources of information compared to the internet. In addition, relatives, friends, and magazines are utilized as the key resources information for women.

2.2.2 Rural Information Services

Rural communities around the world require effective information services (Mtega & Ronald, 2013). Those services are characterized as multidimensional and functioning as a binding line among different groups of villagers. Consistent with Harande's (2009) expression, people are empowered by the information services which afford the required information for solving practical problems being challenged. Various models of information services include service station, farmer's home and association. The accessibility of information services from service station requires physical visits of people to information centers. Examples of information service station are telecentres and rural information resource centers where farmers are able to acquire agricultural

inputs as well as involve in related associations (Mtega & Ronald, 2013). The integration of rural information within telecentre has a considerable role in information distribution for villagers. Therefore, the web content can serve the rural communities by providing the latest knowledge and to make this community more aware about their daily activities (Dogara, 2011).

Das and Dutta (2004), on the other hand, confirmed that the distribution of information services requires trust worthy information services infrastructure. Rural information infrastructure is influential in enhancing the initiatives of rural development in villages. It could be physical or electronic in nature. Speech accessibility, images and mails transference, multimedia document retrieval, and accessing to the radio, television and data should be enhanced through its utilization. This may include the road and vehicles required for transporting hard information resources; rural information centers; and the radio, television, internet and mobile phone infrastructure for transmitting data and audio-visuals. The assessment of the supposed advantages related to the services utilization is important (Mtega & Ronald, 2013). The recognition of information services advantages afforded in rural communities may resulted in the conversion of services into socio-economic development.

2.2.2.1 Types of Information Services in Rural Areas

The appropriate distributions of information services to rural regions can enhance individuals towards actions that can change their lives and provide a greater independence sense. The rural economic growth can be efficiently encouraged through the development of information services industry (Mtega & Ronald, 2013). To satisfy

the information needs of women in particular and the rural society in general, it has been suggested that a library, preferably a mosque library, should be built in the village. This library should include internet services so as to enable women and other divisions of the societies to access the universal information. Furthermore, it can establish a beneficial program such as "go to library" campaign. Services of mobile library presented by the State Library of Selangor must be accessed by all users in this village, like women and the disabled groups who spend most of their time in the house (Bakar, 2011).

Mtega and Ronald (2013) stated that, in most cases, mainly due to the ignorance resulted from either insufficient or poor information services, villagers experience a serious decreased productivity besides social and economic regression. The rural citizens, whether literate or not, should access any kind of information services which improves their ability and creativity in their day-to-day jobs, releases their socio-political obligations efficiently, and then increases their education levels.

Therefore, telecentres are established to enable various community welfare systems by adapting information technology to convey focused distributions of ICTs to achieve development objectives (Njeru, 2014). A range of services may be provided by telecentres including training for ICT literacy, local access to online government information and services, partnerships with community welfare systems in health and education, and sometimes even support for commercial activities.

2.2.2.2 Challenges of Information Service Provision

Various challenges may be faced in introducing information services in rural areas. The information provision in rural areas encounters certain problems such as poor infrastructure, inaccessible roads, limited access to telecommunication networks, and poor electrification. Those obstacles to effective information service delivery limit individuals from contacting appropriate information sources in seeking for the required information (Mtega & Ronald, 2013). However, (Lwoga, 2009) listed other challenges that caused limited accessibility of information, they are: poor quality of information services, poor information center management, low bandwidth, outdated and irrelevant materials and lack of ICT facilities.

Other challenges include information services quality, poor internet connection and lack of stable electrification. For example, in Dhar, a village in rural India, lack of basic infrastructure lack such as electrification and poor connection prevent telecentre from offering effective information services (Conroy, 2006). Besides that, the operation hour of telecentre also affects the services quality. The telecentres only operate during the official working hours during weekdays and for just a short hour during weekends (Bashir et al., 2011).

2.3 What is a Telecentre?

Network infrastructure and localization of content are critical methods; in this respect, the creation of "telecentres" or community ICT centers can serve as common centers where people can have access to the computer and internet (Al-Taie & Kadhim, 2013). In this 21st century, telecentres can play a role in enhancing the lifestyle, personal

satisfaction and strength in learning for people in the rural community (Jalaluddin et al., 2014). The first telecentre in the world was built in Velmdalen, Sweden in 1985 and it was named telecottage (Mbangala & Samzugi, 2014). The principal goal of creating telecentres is to solve the problems of low telecommunication infrastructure quality with associated lower buying and supply caused by unsuitable location of the rural communities (Mahmood, 2005; Mukerji, 2008).

Telecentres offer solution to the issue of affordability by making available easy access to ICTs (Mbangala & Samzugi, 2014; Zahurin et al., 2010). In general, various names have been given to telecentres in different countries; for example, it was known as telecottage in Sweden, Electronic Village Hall in Denmark, and Community Technology Center in USA (Jalaluddin et al., 2014). Alternatively, telecentre is termed a community center as well that offer access to computers, internet and other ICTs tools for individuals, so that they can be able to manage, produce, use and obtain information for commercial and community improvement (Bashir et al., 2011; Reilly & Gómez, 2001).

Telecentres provide a lot of different ICT services for people and serve as a channel for ICT accessibility. They are likely to be located in public places and managed by municipal or nonprofit society (Lee & Sparks, 2014). The combined opportunities offered by telecentres accessibility and cheapness of mobile phones will enable farmers in rural communities and metropolis to access dependable information that will increase their farm production and promotion (Chisita & Malapela, 2015). There are two significant parts being played by telecentres. Firstly, they offer an opportunity for making ICTs services available to the underprivileged; and secondly, they are

established on the basis of having a potential to reduce poverty and enhancing the living standard of the underprivileged (Jawad, 2014).

As stated by Zahurin et al. (2010), the research work means on the effect of community characteristics on the effectiveness of telecentres revealed that telecentre offers numerous Information and Communication Technology (ICT) provisions. For example, Internet accessibility, computers and computer program, electronics, business applications, and other community information services with the objective of accomplishing various advancement purposes, particularly the Internet for academic, as well as individual and socioeconomic improvement development (Harris et al., 2007).

A series of essential concerns is connected to the management and effectiveness of TCs. Other than manageability, government strategy, information and community technology, commercial arrangement, and goals of telecentre, Roman and Colle (2002) have added people's collaboration and involvement besides their pertinence as other critical measurements in developing an effective telecentre.

2.3.1 Pusat Internet Desa (Rural Internet Centre) in Malaysia

The Malaysian government has established a number of projects to provide all sorts of information and knowledge needed by the rural community such as the Rural Internet Center and Rural Information Center (Omar, Shaffril, Bolong, & D'Silva, 2012). Pusat Internet Desa (PID) or Rural Internet Center (RIC) is one of the projects set-ups by the Malaysian government to bring the Internet to small towns and rural communities in Malaysia, and is initially run by the Ministry of Energy, Water and Communication

(MEWC), Malaysia Post Berhad and Maju Sedunia Digital (MSD). However, the responsibility of MEWC has been transferred to the Ministry of Information, Communication and Culture (MICC) (Zahurin, 2014).

The PID was installed with Personal Computers (PCs) with free access to internet at post offices; hence, information about government services and local activities are afforded by the creation of a special web portal (Xue, 2005). In 2011, there have been 40 PID nationwide in the 11th year of the PID establishment, a significant increase of 26 PID centers compared to only 14 PID centers in its earlier year of establishment in 2000 (Hassan, Samah, Shaffril, & D'Silva, 2011).

According to Zahurin (2014) there are 42 PID are developed in thirteen states in peninsula Malaysia excluding the Federal Territories Currently (FTC), as exhibited in Table 2.2.

Table 2.2

Number of PID in Malaysia

State	No.	Location	State	No.	Location
Perlis	1	Simpang Empat	Johor	23	Sri Medan
				24	Pagoh
				25	Labis
				26	Bandar Penawar
				27	Bandar Tenggara
				28	Sungai Mati
Kedah	2	Bukit Kayu Hitam	Kelantan	29	Kuala Balah
	3	Kuala Nerang		30	Kuala Krai
	4	Yan			
	5	Kupang			
Pulau Pinang	6	Balik Pulau	Terengganu	31	Marang
	7	Tasek Gelugor		32	Kuala Besut
Perak	8	Selama	Pahang	33	Sungai Koyan
	9	Kuala Kurau		34	Bukit Goh
	10	Parit		35	Bandar Tun Razak
	11	Langkap			
	12	Tanjung Malim			
Selangor	13	Rasa	Sarawak	36	Kanowit
	14	Beranang		37	Betong
	15	Hulu Langat		38	Mukah
	16	Sungai Pelek		39	Song
	17	Tanjung Sepat			
	18	Sungai Air Tawar			
Negeri Sembilan	19	Lenggeng	Sabah	40	Kota Belud
	20	Kota		41	Tenom
	21	Bandar Sri Jempul		42	Sipitang
Melaka	22	Tanjong Kling			

Source: (Zahurin, 2014)

Among the objectives of the PID establishment are to improve info-communications access in the rural communities, provide internet access terminals where rural residents can afford good access and to provide internet access free-of-charge, develop and update local homepages to provide useful and interesting information for the rural residents, run ICT beginners' courses to raise the ICT literacy and skill level of the rural residents, transfer homepage updating skills to the local PID committee, and stimulate social and economic activities in the community (Zahurin, 2014).

2.4 Sense Making Theory

In 1998, Dervin proposed the theory of sense-making claiming that farmers' ability to create an organized short-term reality can be realized through their recognition of an event happens within a specific setting (i.e. time and place), thus their behaviors will be guided by that reality. Though, according to Dervin, the same farmer will have different behavior when realizing that he is in a different event with a different setting. Dervin's sense-making triangle, figured as a situation– gap– help, considered as a symbol of recognizing the information process. In this sense, Dervin's gap refers to farmers' recognition of their inability to perform their tasks within a specific event since their knowledge is limited (Okiki, 2011).

This theory depicts the rural farmers' nature as a journey mediated by the setting of events with incompetent history providing new events resulted in finding gaps, creating ways to bridge them, assessing the results, and then moving on. To define the needed information of a rural society, it is worth considering the contexts and situations as sources of seeking for information within rural societies. Context plays a crucial role in

information behavior; hence, behavior is conceptualized as revealing farmer's need, searching, and utilizing of information in varied contexts. The interpretation of rural farmers' needs of information should be regarded with setting dimension and gap bridging (Elly & Silayo, 2013).

Along with Wilson's (1999) expression, the methodological values of information behavior in Dervin's model constitute a partial significance due to the description of investigation method that helps in revealing the challenging nature, the scope of information to be employed in filling the uncertainty gap, misperception, and the results nature of information use. Odhiambo et al. (2003) debated that a gap in farmer's knowledge causes the information needs. Gap and information needs are used interchangeably in other models. The setting of an event plays a part in developing out the gap, this, in turn, determines the context that causes information need. Figure 2.1 shows the Dervin's framework.

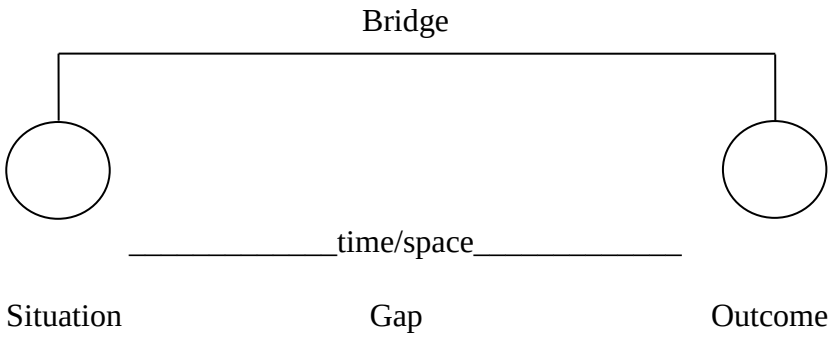

Figure 2.1: Dervin's Sense-Making framework (Wilson, 1999).

Mugwisi (2013) classified the framework of sense-making theory into four basic features:

1- Time and space: describe the context that causes information problems.

2- A gap: differentiates between the contextual situation and the desired situation.

3- An outcome: the result of a sense-making process.

4- A bridge: closes the gap between the situation and the outcome.

The approach to sense-making theory has been developed over many years within the bounds of specific discourse societies. Basically, these societies include the field of library and information science focusing on the study of information needs and search as well as the link between systems and users. The metaphor of sense-making provides the direction to recognize farmers, speak with them, inquire them, and design systems to serve them. In sum, it denotes that the researcher should seek the gap since it forms the starting point to find the action of sense-making in communicating, creating, seeking, using and rejecting of information and knowledge (Dervin, 1998).

Dervin identified three types regarding information searching in the sense making theory, which are: Objective describing the reality through external information; subjective representing our picture or cognitive map of reality through internal information; and sense making information that reflecting the procedures and behaviors that allow us to move between the external and the internal information (Mugwisi, 2013). The framework of sense-making is directed by respectful listening to the users as being theorists and knowledge makers in their worlds; as actors having answers when being asked about what they need. Moreover, the framework presupposes that all interfaces among human beings and the systems they design to serve them are guided by

assumptions about the nature of reality, the nature of human beings and the nature of information and knowledge (Dervin, 1998).

Indisputably, the sense making theory has presented new views concerning studies of information needs for the rural farmers. Although the theory focuses on the individual sense maker, it does not deny that structural factors may affect individual sense making processes because these processes are approached on a rather general level focusing on "generic" characteristics of the farmer's information needs and use (Savolainen, 1995).

2.5 Theoretical Framework

A theoretical framework refers to a general theoretical system with assumptions, concepts and specific social theories. It guides researcher to determine the things that would be measured and the statistical relationships that should be investigated. It is a logically developed, described and elaborated network of association among the variables considered to be relevant to the problem definition through such processes as interviews, observation and literature survey. Moreover, the aim of theoretical frameworks is to make research findings valid and applicable (Lwoga, 2009).

The above arguments verified the uses of Dervin's sense making theory considering the human beings' nature as travelling through time and space coming out of situations with history and partial instructions, attaining new situations, facing gaps, bridging those gaps, evaluating results and moving on (Elly & Silayo, 2013). Thus, the situation and context within which information is sought are important considerations in defining the information needs of people. Context has been believed to be relevant to information

behavior, which is described as "what people need, seek, manage and use information in different contexts" (Savolainen, 2007). According to Dervin's (1998) sense making assumptions, the current knowledge is rarely suited to be applied in future and, in some cases, becomes a future gap. It is noteworthy that the information needs of the rural farmers have to be interpreted as having an element of time-space-movement and gap bridging.

Dervin believes that "a gap" occurs when the farmers face a certain situation in which they cannot accomplish their tasks because of their limited knowledge (Okiki, 2011). The farmers cannot easily express their needs; thus there is a need to develop appropriate strategies to enhance their answers. Therefore, the researcher can provide some questions relevant to their situation giving a suitable way to express their needed information. To conduct the sense making framework, it is required listening to the farmers to know their information needs and then assisting them by providing an appropriate technology, like embedding their needed information in appropriate website and providing a link between the system and the farmers (Dervin, 1998). Moreover, all the information and interaction among the farmers and the systems revealed the nature of farmers, nature of information, as well as knowledge and nature of reality.

2.6 Usability Evaluation

Usability refers to the measure of success a user achieves utilizing a product or system (King & Jannik, 2005). It is the extent to which a computer system enables users, in a given context of use, to achieve specified goals effectively and efficiently while promoting feelings of satisfaction. Usability Evaluation (UE) consists of methodologies

for measuring the usability aspects of a system's User Interface (UI) and identifying specific problems (Ivory & Hearst, 2001). The usability evaluation is discussed from its definitions to its methods. The usability testing involves measuring the quality of the user's experience in developing a particular application, such as the software application, website, electronic devices, mobile phones and so on (Abuzwida, 2008).

The concept of usability has been inexistence since the 1980. It has its roots in usability engineering, where Human Computer Interaction (HCI) examines how users interact with computer technology and looks at ways of making this interaction effective. In the computer science context, usability testing methodologies have been developed generally towards testing software application and website that operate in non-real-time environments. The usability method can be applied in other landscapes such as in the business. Businesses want to please existing customers and attract new ones; they need to understand their customers and the current business climate. One way they accomplish this is through usability testing (Abuzwida, 2008).

According to Dumas and Redish (1999) the goal of a usability test is to improve the process by which products are designed and developed, so that must avoid having the same problem again in other products. This characteristic distinguishes a usability test from a research study, in which the goal is to investigate the existence of some phenomenon. There can be wide variations in where and how can conduct a usability test, Dumas and Redish confirmed that every usability test shares these five characteristics:

- The primary goal test is to improve the usability of a product. For each test can also have more specific goals and concerns that articulate when planning the test.
- The participants represent real users.
- The participants do real task.
- The researcher can observe and record what participants do and say.
- The researcher can analyze the data, diagnose the real problems, and recommend change to fix those problems.

2.6.1 The Methods of Usability Evaluation

There are two general methods to evaluate usability of the website, which are: evaluation by the users (Hiltz & Johnson, 1990); evaluation by the experts (Hughes, 2001). These two methods are used in different kinds of usability evaluation due to their different emphasis. The two methods are user's and expert's evaluations:

- User's evaluation:

  This method mainly consist of user testing, the representatives of real users are observed when they are using the website. The evaluation from user-testing is reliable, because the usability is assessed by the real users. However, it is hard to select correct user samples and train them to be able to manage complicated functions of a website. User centered evaluation including both the formative evaluation and summative evaluation. Formative evaluation is aiming to collect information for the software design while the summative evaluation is used to identify the software

efficiency, effectiveness, and user satisfaction, at the end of the software development (Alzughoul, 2010).

- Expert's evaluation:

  Experts are involved in the usability evaluation to give their professional suggestions and opinion towards the usability of the website. The expert-based evaluation can be done in various ways: heuristic evaluation, standard inspection (Alzughoul, 2010), guideline reviews, consistency inspections, feature inspections and formal usability inspections (Kim, Choi, & Ji, 2008).

2.7 Summary

Chapter 2 provided the literature related to the rural farmers' information needs, information source in rural area, and rural information services. Other issues discussed in this chapter included the concept of telecentre, Pusat Internet Desa (PID) in Malaysia, and the sense making theory to be used as the guiding theoretical framework in this study. It further provided an overview of the usability evaluation and its methods. The conceptual framework and planned methodology for conducting this study is described in detail in the following chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explained the research design and methods used to address the research problem as defined in Chapter 1. The conceptual model, data collection procedure, and prototype development were examined. In addition, this chapter discussed the prototype evaluation of the rural farmers' information needs. Finally, the experiment of usability evaluation was explained as well.

3.2 Research Design

Research design involves the required plans for collecting and utilizing data so that the desired information can be obtained (Creswell, 2013). This study is divided into four main phases as shown in Figure 3.1.

The first phase concerned with the conceptual model development on the basis of the existing literature in order to create a conceptual model related to the sense making theory. The second phase represented the procedures of data collection and analysis. Data were collected by a questionnaire adapted from previous studies. The data analysis was carried out using SPSS software; accordingly, the information needs of the rural farmers were obtained. The third phase focused on the prototype development which was based on the obtained information using modern programming languages to get a prototype for rural farmers' information needs. Finally, the fourth phase dealt with prototype evaluation by developing usability testing questionnaire in order to evaluate

the information needs and determine the extent of successful implementation of the proposed prototype. The research design of this study was based on Peffers, Gengler, and Tuunanen (2003).

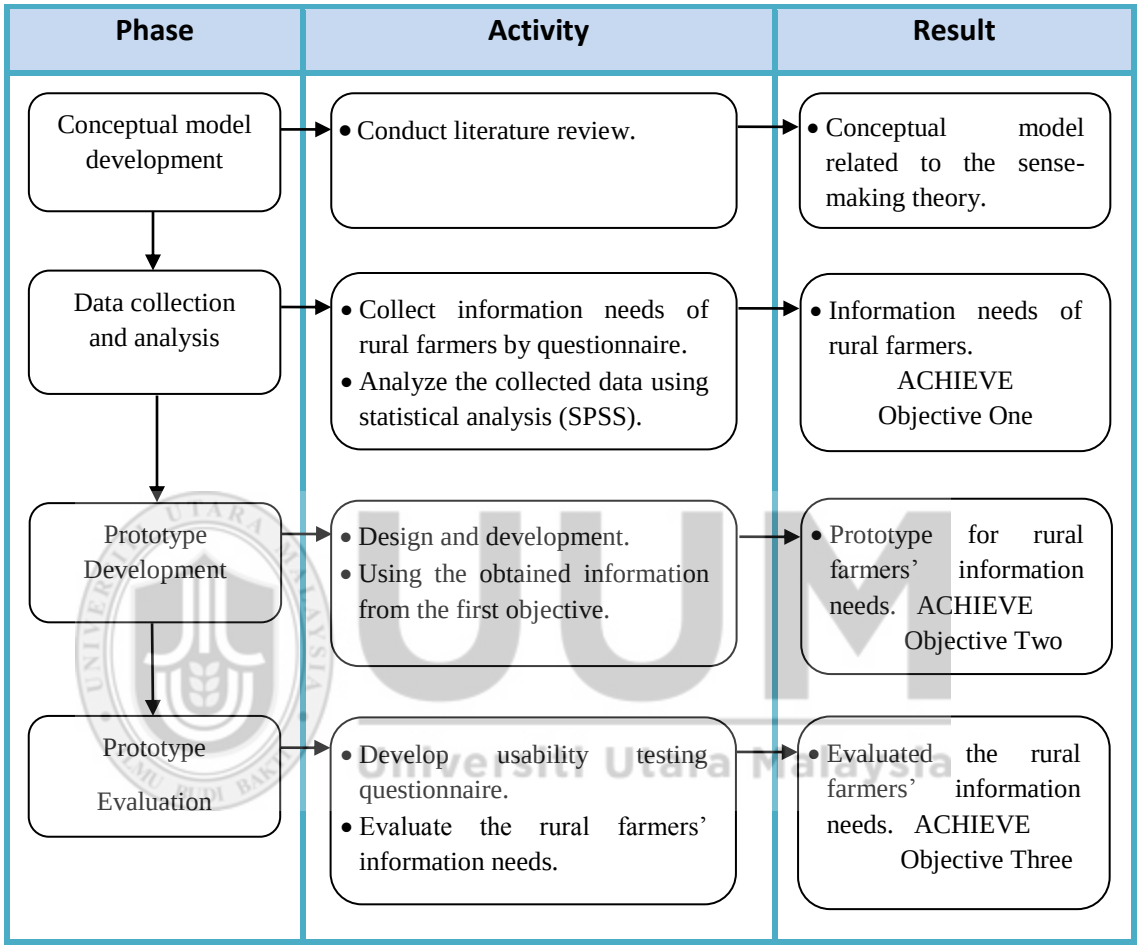

Figure 3.1: Research design

3.2.1 Conceptual model development

The first phase of the research design concerned with developing the conceptual model which helped to address the research problem as defined in Chapter 1. The study was carried out using Dervin's (1998) sense making theory through examining the sources and needs of the information in relation to the rural farmers.

The conceptual model, as shown in Figure 3.2, provides a guideline for the researcher to conduct the study. This model has been developed based on the Dervin's sense making theory in order to understand the rural farmers' information needs. Certain procedures in relation to Dervin's theory were followed in order to develop the model. Firstly, the researcher identified the rural farmers' situation in order to highlight what information they need to attain the desired result; this represented the gap in the model. Next, to bridge this gap, the researcher developed a questionnaire focusing on the nature of rural farmers, reality, information and knowledge, to collect data related to the rural farmers' needs; this step represented the bridge in the model. Finally, this model was developed by designing appropriate prototype which includes the desired information needed by the rural farmers in Kedah; hence, this step represented the outcome of the model.

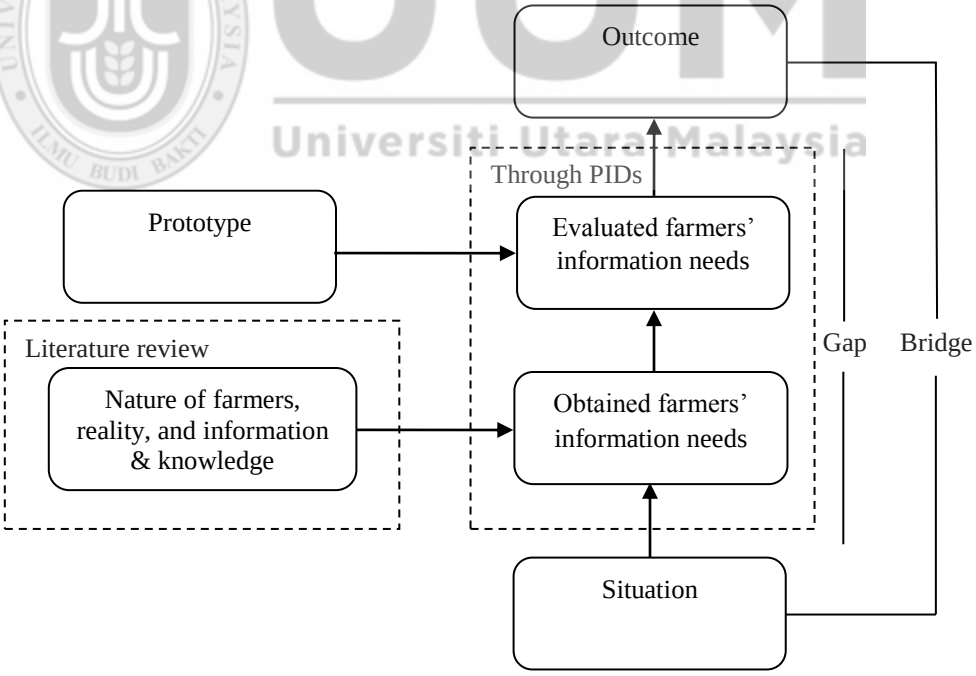

Figure 3.2: A conceptual model of the study.

This model was based on certain components, including: the situation and nature of rural farmers, reality, information and knowledge. According to these components, the researcher obtained the rural farmers' information needs by the questionnaire. This obtained information was embedded in appropriate prototype. Consequently, this embedded information required evaluation in order to attain the desired result. The obtained rural farmers' information needs was evaluated through the distributed questionnaire via the PIDs in Kedah. These activities were followed in order to make a bridge between the situation and the outcome which helps to close the gap related to the rural farmers in Kedah. The relationship among these model components is illustrated in Figure 3.2.

3.2.2 Data Collection and Analysis

The second phase involved data collection and analysis. A quantitative method was used in this study. The quantitative research is used to collect data from a large number of people to determine individual opinions using predetermined instruments in order to describe a research problem (Creswell, 2013). The questionnaire is used as a tool for deriving various suggestions from respondents such as their views and needs; this has been obtained from the respondent's answers to the questions addressed in the questionnaire based on the research to be conducted.

The questionnaire in this study was adapted from Isaya (2015) and Lwoga (2009) (see Appendix A). In Isaya's study, the respondents were female and the survey focused on the demographic characteristics, source of the agriculture information, information needs, innovative farming practices, ICT exposure usage and challenges, extension of

service contact, and other faced challenges. While, Lwoga's survey focused on questions related to personal information, various types of agricultural indigenous knowledge, source of information, information needs, access to exogenous knowledge in the local communities, the role of ICT in managing farming systems and barriers that obstruct the effective management of farming systems in the local communities.

The entire questionnaire and selected questions was relevant to the purpose of this study. Hence, the questionnaire was translated into Malay language, which is the local language of the rural farmers in Kedah. The questionnaire was divided into three sections:

The first section was about the general information of the respondents such as gender, age, level of education and connectivity to ICT. This section was included to help the researcher take an overview about the rural farmers' qualification and their level in using the ICT. The second section concerned with sources of information, such as personal experience, parents/family, neighbors, friends, women meetings, TV, observation, magazines, and so on. The information gathered from this section will be used to describe the rural farmers' sources of information on modern farming methods. Finally, the third section related to the farmers' information need such as soil classification, crop varieties, crop husbandry, irrigation, agricultural tools, livestock feeding, livestock husbandry, financial facilities, and so on. This section was included in order to determine the rural farmers' information needs, which can help him in managing their related activities. The obtained information needs were analyzed and used to develop the prototype of information model.

The rural farmers in Kedah represented the respondents' sample of this study, and the questionnaire copies were distributed to those rural farmers in four areas having PIDs, namely Bukit Kayu Hitam, Kuala Nerang, Yan, and Kupang. The data were analyzed by using the Statistical Package for the Social Sciences (SPSS) software which sorted, simplified and summarized data into statistics reflecting the importance of the factor or behavior they represent (Kanny, 2014; Kock, 2010). Upon completing this step, objective 1 of the study is achieved.

3.2.2.1 Sampling

According to Khan and Baig (2013) Kedah's total population is 1.8 million, approximately 61.3 % of it resides in the rural areas (Ibrahim et al., 2010). Consistent with Roscoe (1975) (cited in Israr, Jan, Ahmad, & Rahman, (2015) and Lin & Chen, (2006)), the most effective sample size of respondents is more than 30 and less than 500. Hence, this study involved rural farmers as participants lived in Kedah state and used PID in achieving the study objectives.

The questionnaire copies were distributed to 200 rural farmers, however only 187 copies were analyzed and the remained 13 copies were discarded because some questions have more than one answer. The purpose of this questionnaire was to obtain the rural farmers' information needs in area near the four Pusat Internet Desa (PID) in Kedah, namely PID Bukit Kayu Hitam, PID Kuala Nerang, PID Yan, and PID Kupang.

3.2.3 Prototype Development

The development of prototype model was based on the requirements gathered from the previous phase and the provided relevant documentations. Appropriate programming languages such as PHP and Java script as well as other programs like MySQL, Wamp server, and Photoshop were used to construct and design the desired prototype.

This prototype provided the rural farmers' requirements and information needs. Hence, it include some of functions to achieve rural farmers' satisfaction such as register, login, change language, change font size and color, download document, display information, edit profile, send message, manage information, announcement, and logout. The result of this phase was the design of prototype model that fulfilled the rural farmers' information needs in Kedah. At this stage, the study achieved objective 2. The prototype development environment is shown in Table 3.1.

Table 3.1

Prototype development environment

Prototype Development Environment	
Programming language	PHP v5.5.12, Java Script
Server	Wamp Server v2.5
Database	MySQL v5.6.17
Operating System	Windows 10

3.2.4 Prototype Evaluation

After prototype was developed, an evaluation was carried out by the end-users, in order to evaluating the rural farmers' information needs. Meanwhile, the evaluation was

involving two sections: functionality test and user usability test. The functionality test has been prepared by the developer to ensure the prototype is works correctly. Also, the user usability test was evaluated by 30 rural farmers who lived in Kedah, Malaysia in area of PIDs of Bukit Kayu Hitam and Kuala Nerang (Alorfi, 2012; Salih, 2012). The purpose of user usability test was to evaluate the rural farmers' information needs.

The researcher copies of the questionnaire distributed to 14 rural farmers in area of PID Bukit Kayu Hitam, and 16 rural farmers in area of PID Kuala Nerang. Each copy of the questionnaire was attached with a scenario explaining the purpose of using this questionnaire for the respondents (as described in the next section). The respondents used the product to evaluate their needed information and then answered the questions. All collected data were analyzed quantitatively to conclude the results of usability test by using SPSS software. At this stage, the study achieved objective 3.

3.2.4.1 Experiment of Usability Evaluation

The usability evaluation is accomplished by the rural farmers in Kedah. The developer uploaded the prototype online, and then distributed the questionnaire to the participants. The questionnaire was divided in to two sections, the first section asked about general information of the respondents such as gender, age, level of education, and farming sector. While, the second section asked the participants regarding evaluate the rural farmers' information needs in term of usefulness and easiness. The questionnaire was attached with a scenario explaining the main purpose of this prototype to the participants so as to evaluate the product. The scenario content was as follows:

"The website is created to serve the rural community in Kedah, Malaysia, especially the rural farmers. The objective of the website is to help rural farmers to gain more knowledge and skills in managing farming related activities. You are required to use the website to find the information that is relevant to your needs, particularly in managing farming related activities. The exercise should take about 20 minutes. Upon completion of this exercise, kindly answer the given questionnaire".

3.2.4.2 Instrumentation

The study used two instruments to collect the data from the respondents regarding evaluate the rural farmers' information needs. The types of evaluation are discussed below.

1. Evaluating the functionality: The items were adopted in the questionnaire to test all functions of the prototype (Daradkeh, 2010). The functionality test was carried out to ensure that the prototype functioned as desired. Each function in the prototype was tested, as detailed in Chapter 5.

2. Evaluating the usability: The questionnaire (detailed in Appendix B) was divided into two sections. The first section focused on the general information in relation to the respondents, including: gender, age, level of education, and farm sector. While the second section contained twenty items adopted from Ariff, Yan, Zakuan, Ishak, and Ismail (2013); Chen, Ling, Ying, and Meng (2012); Davis (1989); Reitsamer, Kaschig, Heinz, and Sauer (2014) to evaluate the rural farmer's information needs. According to Brooke (1996); Gliem and Gliem (2003), Likert

scale is used for all questionnaire items on five points, which were: (1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= Strongly Agree).

3.3 Summary

Chapter 3 provided the methodology that was applied to answer the research questions of this study. The proposed research design contained four main phases including conceptual model development, data collection and analysis, prototype development, and prototype evaluation to examine the research problem. The data were collected using the questionnaire technique method and analyzed quantitatively. The collected data were useful to achieve the research objectives. The research findings and evaluations were presented in Chapter 4 and 5 respectively.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter discusses the findings of the study based on the objectives stated earlier. The findings of this chapter led us to identifying the basic requirements of the rural farmers to develop and include these requirements in a prototype.

The collected data have been analyzed using the statistical instrument of analysis SPSS version 20. Table 4.1 illustrates the distribution of questionnaire through the four PID in Kedah. Two hundred copies of questionnaire have been distributed to the rural farmers. From the 200 completed and returned questionnaires, 13 (6.5%) were unusable because some questions contained more than one answer. Therefore, the total number of usable questionnaires, which was 187 (93.5%), is considered to be useful for this study. The findings are discussed under the following subheadings:

1. Profile of respondents.
2. Farmer's information source.
3. Farmer's information needs.

Table 4.1 exhibited the number of questionnaires that distributed and returned through four of Pusat Internet Desa in Kedah, with regarded the numbers of usable questionnaires.

Table 4.1

Questionnaire distribution

Name	Distributed	Returned	Usable
PID Bukit Kayu Hitam	50	50	48
PID Kuala Nerang	50	50	45
PID Yan	50	50	46
PID Kupang	50	50	48
Total	200	200	187

4.2 Profile of Respondents

The first section in the questionnaire focuses on the general information about the respondents. Table 4.2 summarizes the general information of the respondent participated. It is noticed that female recorded higher percentage of PID internet users 55.6% than male 44.4%. Most of the participating users aged between 18 to 24 years old representing of 26.7%, followed by those aged less than 18 (20.9%), between 25 to 34 (18.7%), 35 to 44 years 13.9%, and between 45 to 54 (11.2%). The rest 8.6% is those aged 55 and over. Regarding their education, 44.9% represents respondents who have high school level, 17.6% have diploma, 15.5% for primary school, and 12.3% for bachelor degree while other respondents were represented as 8.6% who have pre-university level, and finally 0.5% without having formal education and others.

Table 4.2

Respondents' profile

Gender	Frequency	Percentage
Female	104	55.6 %
Male	83	44.4 %

Age		
Less than 18	39	20.9 %
18-24	50	26.7 %
25-34	35	18.7 %
35-44	26	13.9 %
45-54	21	11.2 %
55 and over	16	8.6 %
Qualification		
Primary school	29	15.5 %
Secondary school	84	44.9 %
Pre university education	16	8.6 %
Diploma	33	17.6 %
Bachelor degree	23	12.3 %
No formal education	1	0.5 %
Others	1	0.5 %

Table 4.3 shows the findings regarding the computer ownership. Most of the rural farmers own computer 54% while 46% of them do not.

Table 4.3

Computer ownership

Have computer	Frequency	Percentage
Yes	101	54%
No	86	46%
Total	187	100 %

Table 4.4 reveals that 33.2% of the respondents use internet through the PID once a month, 25.7% once a week, 24.6% more than once a week and 16.6% use it daily.

Table 4.4

Using internet through PID

Using internet through PID	Frequency	Percentage
Daily	31	16.6%
Once a week	48	25.7%
More than once a week	46	24.6%
Once a month	62	33.2%
Total	187	100 %

Table 4.5 clarifies the main purposes of internet usage by the rural farmers in Kedah. Most of the respondents basically use the internet to improve their job 56.1%, contact their friends' 21.4% and 16% use it for entertainment while 6.4% use it for other purposes.

Table 4.5

Purposes of using internet

Purposes of using internet	Frequency	Percentage
Improve the job	105	56.1%
Connect with friends	40	21.4%
Entertainment	30	16%
Others	12	6.4%
Total	187	100 %

The other information that were obtained from internet was recorded as the highest percentage of respondents namely 35.3 %, followed by 32.1% for market price

information, then 25.1% for information of farm practices, and finally the lowest one was recorded for weather information as 7.5%; as shown in Table 4.6.

Table 4.6

Information obtained from internet

Information obtained from internet	Frequency	Percentage
Weather	14	7.5 %
Market price	60	32.1 %
Farm practices	47	25.1 %
Other	66	35.3 %
Total	187	100 %

4.3 Farmer's Information Source

The second section of the questionnaire was about the respondents' opinions concerning the medium source of accessing information in rural community. Table 4.7 reveals that the respondents received most of the information through the highest three sources, which include: TV 62.6%, friends 56.7%, and parents/family 55.1%, followed by newspaper 52.4% and neighbors 47.1%. However, a low number of respondents 13.4% for those got information from social group gatherings, 11.2% mosque, and 10.7% women meetings.

Table 4.7

Source of information

Items	Frequency	Percentage	Rank
TV	117	62.6 %	1
Friends	106	56.7 %	2
Parents/ family	103	55.1 %	3
Newspapers	98	52.4 %	4
Neighbors	88	47.1 %	5
Personal experience	79	42.2 %	6
Farmers' groups	68	36.4 %	7
Magazines	66	35.3 %	8
Observation	55	29.4 %	9
Posters	51	27.3 %	10
Cell phone	50	26.7 %	11
Radio	47	25.1 %	12
Information center	45	24.1 %	13
Village meetings	43	23.0 %	14
Newsletters	42	22.5 %	15
Village leaders	26	13.9 %	16
Social group gatherings	25	13.4 %	17
Mosque	21	11.2 %	18
Women meeting	20	10.7 %	19

4.4 Farmer's Information Needs

In this section the respondents were asked about their information needs. All the questions were based on five scale points which are from 1 to 5. Regarding the questions which were not relevant to the respondents, the not applicable option (0) was provided. Table 4.8 shows the importance of soil classification information among the rural farmers. Noticeably, 58.3% of the respondents regarded this type of information as

important and 10.7% of them considered it as neither not important nor important. The remaining respondents' 24.6% and 6.4% represented the scales of not important and not applicable respectively.

Table 4.8

Information relating to soil classification

Scale	Frequency	Percentage
Not applicable	12	6.4 %
Not important	46	24.6 %
Neither not important nor important	20	10.7 %
Important	109	58.3 %
Total	187	100 %

Concerning results shown in Table 4.9, the highest number represented the importance of crop varieties information for 57.8% of total respondents; next 18.7% of them regarded it as neither not important nor important; while those believed that it is not important and not applicable were 17.6% and 5.9% respectively.

Table 4.9

Information relating to crop varieties

Scale	Frequency	Percentage
Not applicable	11	5.9 %
Not important	33	17.6 %
Neither not important nor important	35	18.7 %
Important	108	57.8 %
Total	187	100 %

Furthermore, Table 4.10 shows the results of the importance of crop husbandry information for respondents. According to those results, this information was of highly importance since it was recorded as the highest number, namely as 59.9% of total respondents; while 19.3% regarded it as neither not important nor important; and 15% found it not important. Finally, the lowest number referred to not applicable by 5.9% corresponding with that of crop varieties in the previous table.

Table 4.10

Information relating to crop husbandry

Scale	**Frequency**	**Percentage**
Not applicable	11	5.9 %
Not important	28	15 %
Neither not important nor important	36	19.3 %
Important	112	59.9 %
Total	187	100 %

Table 4.11 bellow illustrates the importance of irrigation information. The results revealed that the irrigation information satisfied their needs. Particularly, this information was denoted as important by slightly more than 60% of total participants; however, 19.8% of them considered it as neither not important nor important; and it was believed to be not important by 13.3% and not applicable by 5.9%.

Table 4.11

Information relating to irrigation

Scale	Frequency	Percentage
Not applicable	11	5.9 %
Not important	25	13.3 %
Neither not important nor important	37	19.8 %
Important	114	61 %
Total	187	100 %

Concerning the importance of agricultural information, it was believed to be important by 56.7% of the respondents who required it to enhance their job. On the other hand, it was viewed as neither not important nor important by 19.3% and not important by 17.1%; in exception for 7% of the respondents regarded it as not applicable, as shown in Table 4.12.

Table 4.12

Information relating to agricultural

Scale	Frequency	Percentage
Not applicable	13	7 %
Not important	32	17.1 %
Neither not important nor important	36	19.3 %
Important	106	56.7 %
Total	187	100 %

On the other hand, the importance of livestock feeding information was taken into account as well. As illustrated in Table 4.13, it was shown that slightly less than 57 % of

the respondents viewed this information as important and 15% as neither not important nor important. However, fairly less than 20% of the respondents considered it as not important and 8.6% as not applicable.

Table 4.13

Information relating to livestock feeding

Scale	Frequency	Percentage
Not applicable	16	8.6 %
Not important	37	19.7 %
Neither not important nor important	28	15 %
Important	106	56.6 %
Total	187	100 %

Table 4.14 details the results for the importance of livestock husbandry information. Here, the importance of this information was recorded by 54.6% of the respondents, while 15.5% regarded it as neither not important nor important; except 20.8% said it was not important and 9.1% not applicable.

Table 4.14

Information relating to livestock husbandry

Scale	Frequency	Percentage
Not applicable	17	9.1 %
Not important	39	20.8 %
Neither not important nor important	29	15.5 %
Important	102	54.6 %
Total	187	100 %

Furthermore, the importance analysis of financial facilities information is shown in Table 4.15 below. The highest rank was for important scale by 63.1% of respondents; then, neither not important nor important by 16.6%; the remaining scales of not important and not applicable were 14.4% and 5.9% respectively.

Table 4.15

Information relating to financial facilities

Scale	**Frequency**	**Percentage**
Not applicable	11	5.9 %
Not important	27	14.4 %
Neither not important nor important	31	16.6 %
Important	118	63.1 %
Total	187	100 %

Other required information to be important for rural farmers is related to harvest management. The results shown in Table 4.16, reveals that 61% of the concerned respondents in this study viewed it as important; 18.2% as neither not important nor important; and less than 21% represented both not important and not applicable together.

Table 4.16

Information relating to harvest management

Scale	**Frequency**	**Percentage**
Not applicable	12	6.4 %
Not important	27	14.5 %
Neither not important nor important	34	18.2 %
Important	114	61 %
Total	187	100 %

Based on the results shown in Table 4.17, 59.9% of the respondents stated that the weather information was important resembling that of crop husbandry. While the neither not important nor important were by 21.4%; and others considered it as not important and not applicable by 12.3% and 6.4% respectively.

Table 4.17

Information relating to weather

Scale	**Frequency**	**Percentage**
Not applicable	12	6.4 %
Not important	23	12.3 %
Neither not important nor important	40	21.4 %
Important	112	59.9 %
Total	187	100 %

Besides weather information, the importance of farm preparation information was required as well. The top number was for important recorded by 60.4% of the respondents; followed by 16% for neither not important nor important; then, slightly below 15% for not important; and lastly 8.6% for not applicable. As shown in Table 4.18 below.

Table 4.18

Information relating to farm preparation

Scale	**Frequency**	**Percentage**
Not applicable	16	8.6 %
Not important	28	14.9 %

Neither not important nor important	30	16 %
Important	113	60.4 %
Total	187	100 %

Furthermore, the importance of soil fertilization information was among the required items for the rural farmers. The results of this part are shown in Table 4.19. It is realized that the highest number of respondents was attached to important by 62%; whereas neither not important nor important was represented by 16.6%. In addition, less than 22% of total respondents represented the not important, and exactly 8.6% out of them said that it is not applicable.

Table 4.19

Information relating to soil fertilization

Scale	**Frequency**	**Percentage**
Not applicable	16	8.6 %
Not important	24	12.9 %
Neither not important nor important	31	16.6 %
Important	116	62 %
Total	187	100 %

Additionally, the importance of the crop price information is describes in Table 4.20. The results revealed that 58.9% of the respondents considered this information as important while 18.2% of them regarded it as neither not important nor important; this result, in turn, corresponding with that of harvest management information. Then, the remaining, approximately 23%, referred to both not important and not applicable.

Table 4.20

Information relating to crop price

Scale	Frequency	Percentage
Not applicable	13	7 %
Not important	30	16.1 %
Neither not important nor important	34	18.2 %
Important	110	58.9 %
Total	187	100 %

The agriculture marketing information was a major item among other required information by the rural community since it was ranked on the top of the important information for farmers. This is illustrated in Table 4.21. Hence, it is clearly revealed that nearly 64% of the respondents agreed on its importance; slightly above 13% described it as neither not important nor important; while 5.9% and 17.1% were related to not applicable and not important respectively.

Table 4.21

Information relating to agriculture marketing

Scale	Frequency	Percentage
Not applicable	11	5.9 %
Not important	32	17.1 %
Neither not important nor important	25	13.4 %
Important	119	63.7 %
Total	187	100 %

Crop store information is one of the important information that was regarded in this study. Table 4.22 indicates the results of its importance. Firstly, 62.5% of the respondents viewed it as important to be ranked as fourth among other important information required by the rural farmers in this study. Then, 18.2% believed it to be neither not important nor important. And finally, more than 19% found it both not important and not applicable.

Table 4.22

Information relating to crop store

Scale	**Frequency**	**Percentage**
Not applicable	13	7 %
Not important	23	12.3 %
Neither not important nor important	34	18.2 %
Important	117	62.5 %
Total	187	100 %

The importance of livestock diseases information is also one of the items listed in this study. Table 4.23 shows that only 23% of the respondents denoted it as both not applicable and not important, as well as around 17% of them as neither not important nor important, while the highest number was for important by nearly 60%.

Table 4.23

Information relating to livestock diseases

Scale	Frequency	Percentage
Not applicable	17	9.1 %
Not important	26	13.9 %
Neither not important nor important	32	17.1 %
Important	112	59.9 %
Total	187	100 %

Moreover, the importance of plant diseases information to be included in a web contents was required as well. The results shown in Table 4.24 indicate that exactly 59.4% of the respondents agreed on its importance. Concerning other respondents, some opinions were 20.3% for neither not important nor important and around 20% for both not applicable and not important.

Table 4.24

Information relating to plant diseases

Scale	Frequency	Percentage
Not applicable	14	7.5 %
Not important	24	12.8 %
Neither not important nor important	38	20.3 %
Important	111	59.4 %
Total	187	100 %

Besides, the pest management information was listed in the questionnaire content. The mentioned results in Table 4.25 revealed that nearly 63% of the respondents categorized

it as important; 18.2% was for neither not important nor important; while 12.3% was for not important and 7% not applicable.

Table 4.25

Information relating to pest management

Scale	Frequency	Percentage
Not applicable	13	7 %
Not important	23	12.3 %
Neither not important nor important	34	18.2 %
Important	117	62.6 %
Total	187	100 %

Table 4.26 below illustrates the importance of weeding information. This information is described as important by 57.7% of total respondents whereas 18.2% as neither not important nor important; and 17.7% as summed it was not important. Finally, other respondents believed it was not applicable by exactly 6.4%.

Table 4.26

Information relating to weeding

Scale	Frequency	Percentage
Not applicable	12	6.4 %
Not important	33	17.7 %
Neither not important nor important	34	18.2 %
Important	108	57.7 %
Total	187	100 %

In addition to that, the seed variety information in the web content is important for the rural community. As illustrated in Table 4.27, 62% of the respondents believed it was important; around 18% was for neither not important nor important. Meanwhile, slightly below 20% viewed this information as both not important and not applicable.

Table 4.27

Information relating to seed variety

Scale	**Frequency**	**Percentage**
Not applicable	13	7 %
Not important	24	12.9 %
Neither not important nor important	34	18.2 %
Important	116	62 %
Total	187	100 %

Additionally, the mean for each item was investigated. The results are listed in Table 4.28. It is clear that most items have high mean score ranging from 3.5 to 3.7. Besides, the standard deviations are small, around 1.4. Likewise, all the items were ranked according to the importance levels that were chosen by the rural farmers in Kedah. As shown in Table 4.28 below, the first rank was agriculture marketing fallowed by financial facilities, pest management, crop store, soil fertilization, and so on. On the other hand, the last rank was livestock husbandry. At this point and based on the results, this study aimed at embedding these important information that already needed by the rural farmers in Kedah into a prototype to serve this community.

Table 4.28

Descriptive statistics

Items	N	Mean	Std. deviation	Percentage	Rank
Agriculture marketing	187	3.63	1.516	63.7%	1
Financial facilities	187	3.71	1.485	63.1%	2
Pest management	187	3.62	1.443	62.6%	3
Crop store	187	3.63	1.491	62.5%	4
Soil fertilization	187	3.59	1.557	62%	5
Seed variety	187	3.65	1.495	62%	6
Irrigation	187	3.69	1.454	61%	7
Harvest management	187	3.54	1.456	61%	8
Farm preparation	187	3.52	1.542	60.4%	9
Crop husbandry	187	3.58	1.442	59.9%	10
Weather information	187	3.58	1.413	59.9%	11
Livestock diseases	187	3.49	1.542	59.9%	12
Plant diseases	187	3.55	1.495	59.4%	13
Crop price	187	3.54	1.521	58.9%	14
Soil classification	187	3.45	1.623	58.3%	15
Crop varieties	187	3.51	1.482	57.8%	16
Weeding	187	3.44	1.455	57.7%	17
Agricultural	187	3.42	1.451	56.7%	18
Livestock feeding	187	3.35	1.574	56.6%	19
Livestock husbandry	187	3.27	1.557	54.6%	20
Valid N (list wise)	187				

4.5 Reliability

The reliability was examined in this study. It was ensured through the Cronbach's alpha. Following the data collection procedure, each information source and information needs of the rural farmers have been tested for reliability aspect. Based on the collected data,

the results were reasonable according to Cronbach's alpha that 0.843 for information source and 0.981 for information needs, as shown in Tables 4.29 and 4.30. With reference to Coakes and Steed (2009), it will be highly reliable alpha if it is more than 0.7.

Table 4.29

Reliability result of information source

Cronbach's Alpha	No. of Items
.843	19

Table 4.30

Reliability result of information needs

Cronbach's Alpha	No. of Items
.981	20

4.6 Categorization of Information Needs of Kedah Rural Farmers

There were twenty items of required information by the rural farmers in Kedah. Most of this information belongs to one category, so this information was classified into eight categories, including: Plant information, crop information, and soil information and so on, to facilitate their use by the rural farmers. Figure 4.1 illustrates the relationships among these categories.

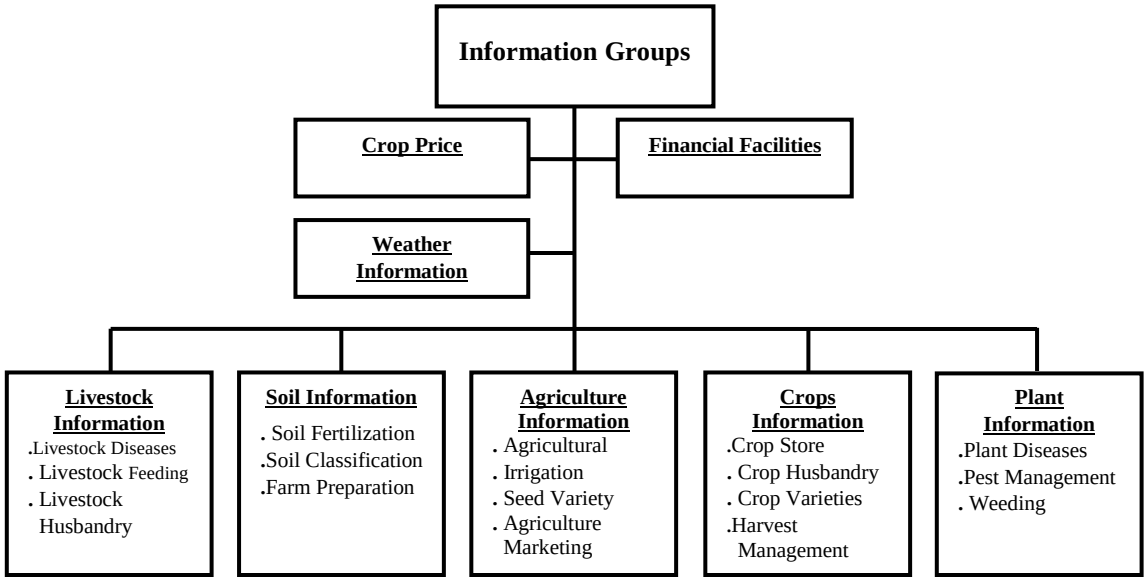

Figure 4.1: Categorization of information needs

4.7 Summary

This chapter focuses on the information needs of the rural farmers in Kedah. Actually, all the information that included in the questionnaire was indeed needed by the rural farmers in Kedah as shown in the previous tables. It can be noticed that all the rural farmers perceived the whole information in the survey were important. This is demonstrated by the results that shown in Tables 4.8 until Table 4.27. The agriculture marketing, financial facilities, pest management, crop store, and soil fertilization information, they are ranked as the top five in terms of the information importance. Then, they are followed by the seed variety, irrigation, harvest management etc. As shown in Table 4.28. Finally, this information is classified into categorizes to be contained into the prototype.

CHAPTER FIVE

PROTOTYPE IMPLEMENTATION AND EVALUATION

5.1 Introduction

This chapter focuses on the implementation and evaluation of the prototype for the rural farmers in Kedah, which are representing the main objective in this study. Firstly, the prototype development steps outlined in Chapter 3 were described in this chapter. Then, the requirements identified in Chapter 4 were incorporated and presented in this prototype. The study was examined by two evaluation tests, functionality test and user usability test.

5.2 Prototype Implementation and User Interface

The prototype has been successfully and completely developed showing all the defined requirements. PHP and Java script were used to develop the prototype, besides MySQL for the database. The prototype is named as INRFK representing the acronym for 'Information Need of Rural Farmers in Kedah'. The following snapshots represent a sample of user interfaces in both languages Malay and English.

5.2.1 Main Page

This is the first page which was presented to the user when he/she is accessing the website. The user was required to enter a link address of the website so as to get access to the INRFK website. Figures 5.1 and 5.2 show the home page of the INRFK, it is

noticed that the prototype is available in both local language of the rural farmers (Malay) and English language.

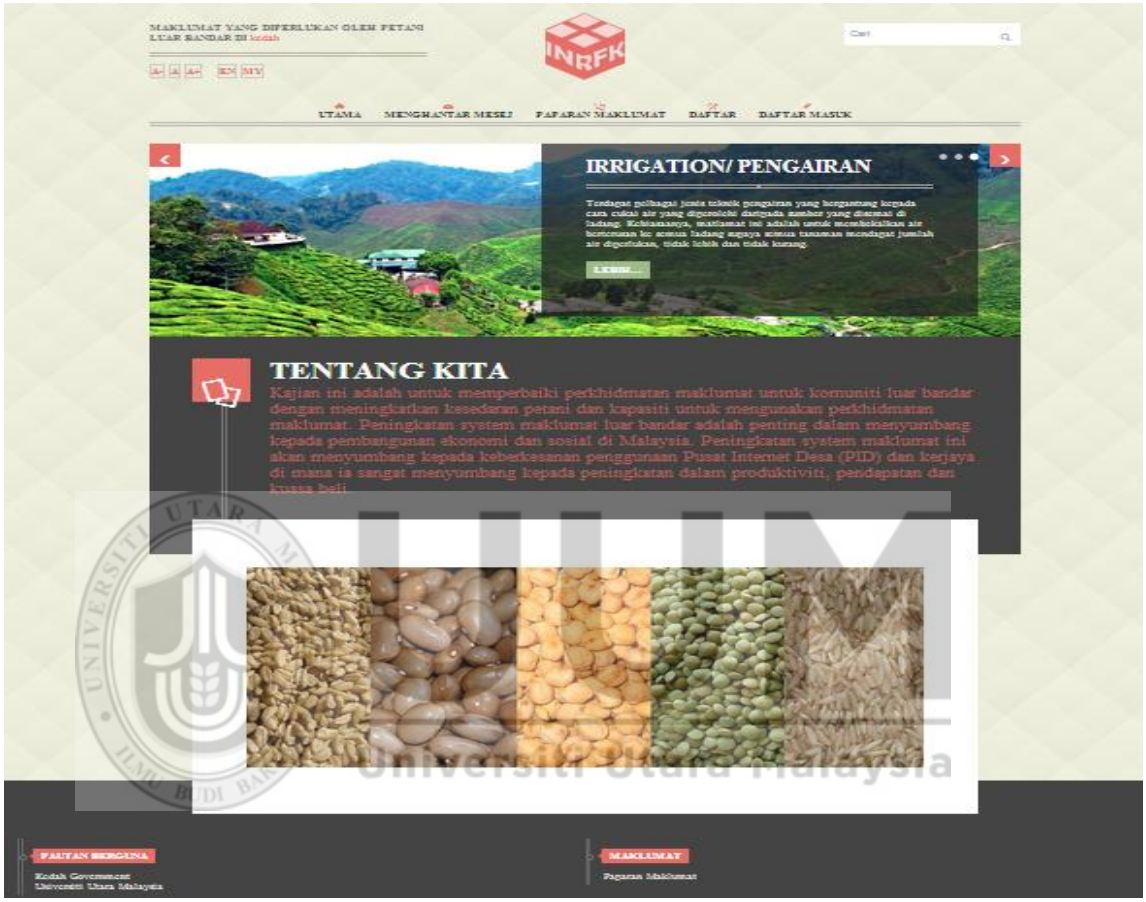

Figure 5.1: The INRFK in Malay language

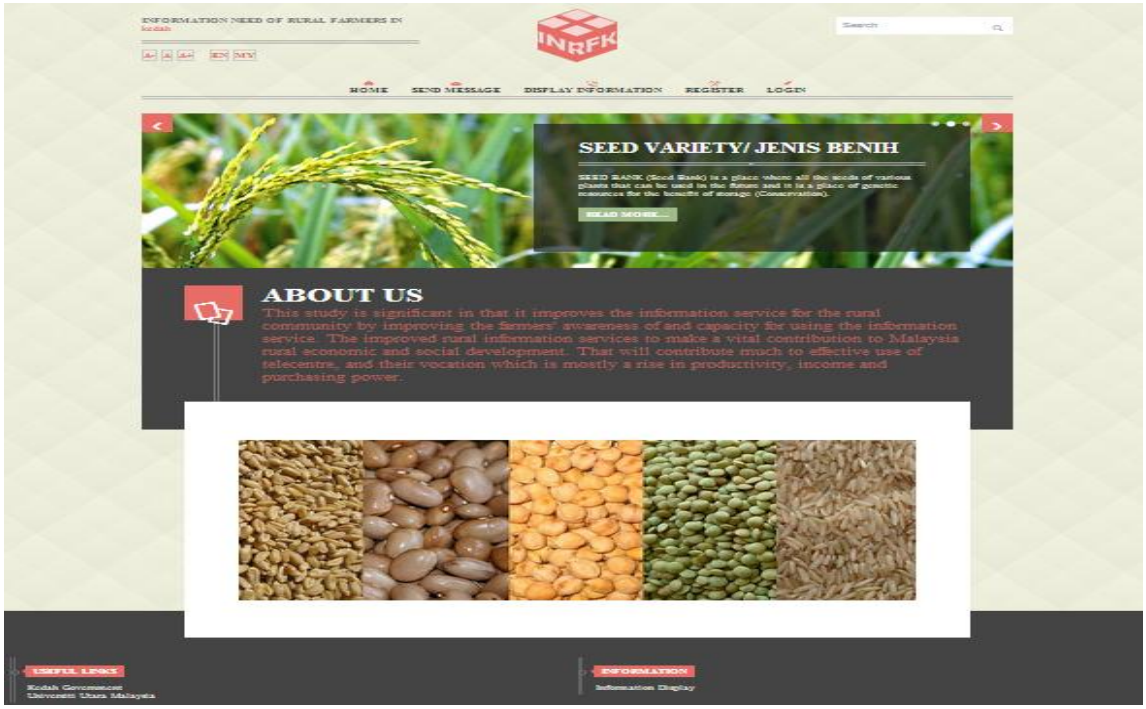

Figure 5.2: The INRFK in English language

5.2.2 Registration Page

This page, represented by Figure 5.3, can be accessed from the main page via "Register" button. To register in this website (INRFK), the user was required to enter all the required information in the fields.

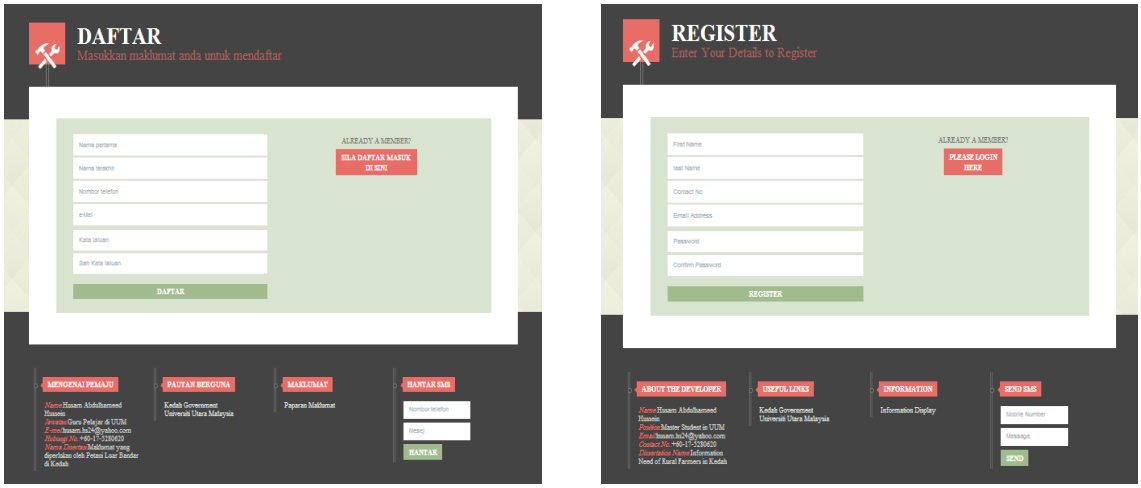

Figure 5.3: Registration page in Malay and English languages

5.2.3 Login Page

Figure 5.4 illustrates the login interface of the INRFK prototype. The valid username and password is required in this page as a key to allow the user to login and access to the prototype. For the security purpose, when the user enters the password, it will appear as dots instead of plain text. When the username and password are entered by the user, the INRFK will check and verify them from his/her information in the database. If they are correct, the website will allow the access to other available functions in the website.

Figure 5.4: Login page in Malay and English languages

5.2.4 Display Information Page

This page is shown in Figure 5.5. The user can access to the display information page, after finishing his/her register and logging in INRFK. This page presents the required information by the rural farmers in Kedah. It also displays the classification of the information into groups according to the related information as described in Chapter 4, section 6.

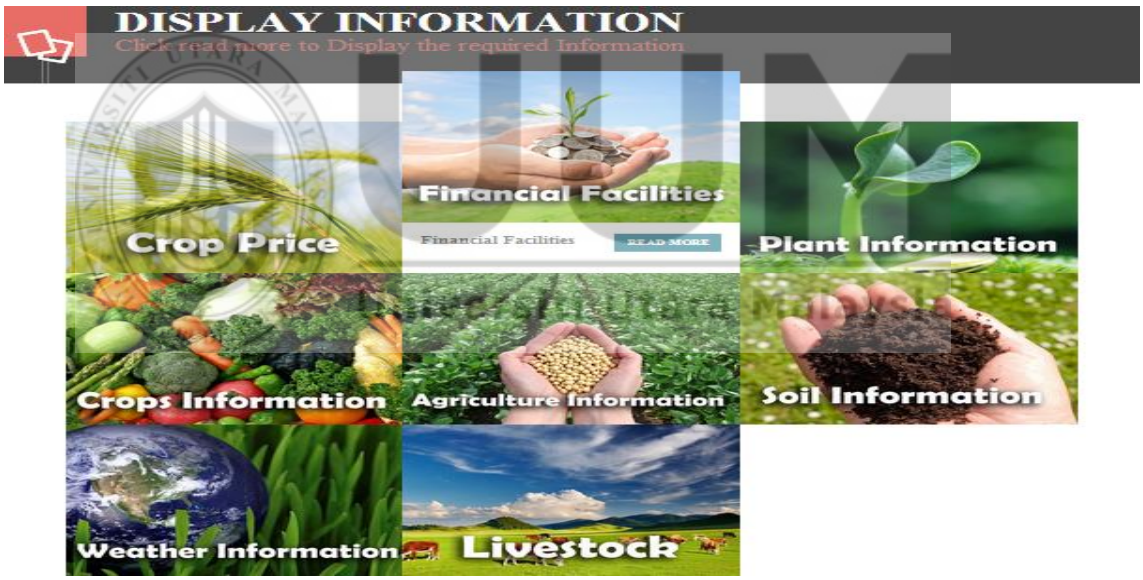

Figure 5.5: Display information page in Malay and English languages

5.2.5 The Management of the INRFK Information Page

Figure 5.6 shows the management of the INRFK information page of the website. It is realized that the website permitted the admin to manage the information of the INRFK (add and delete) in the database.

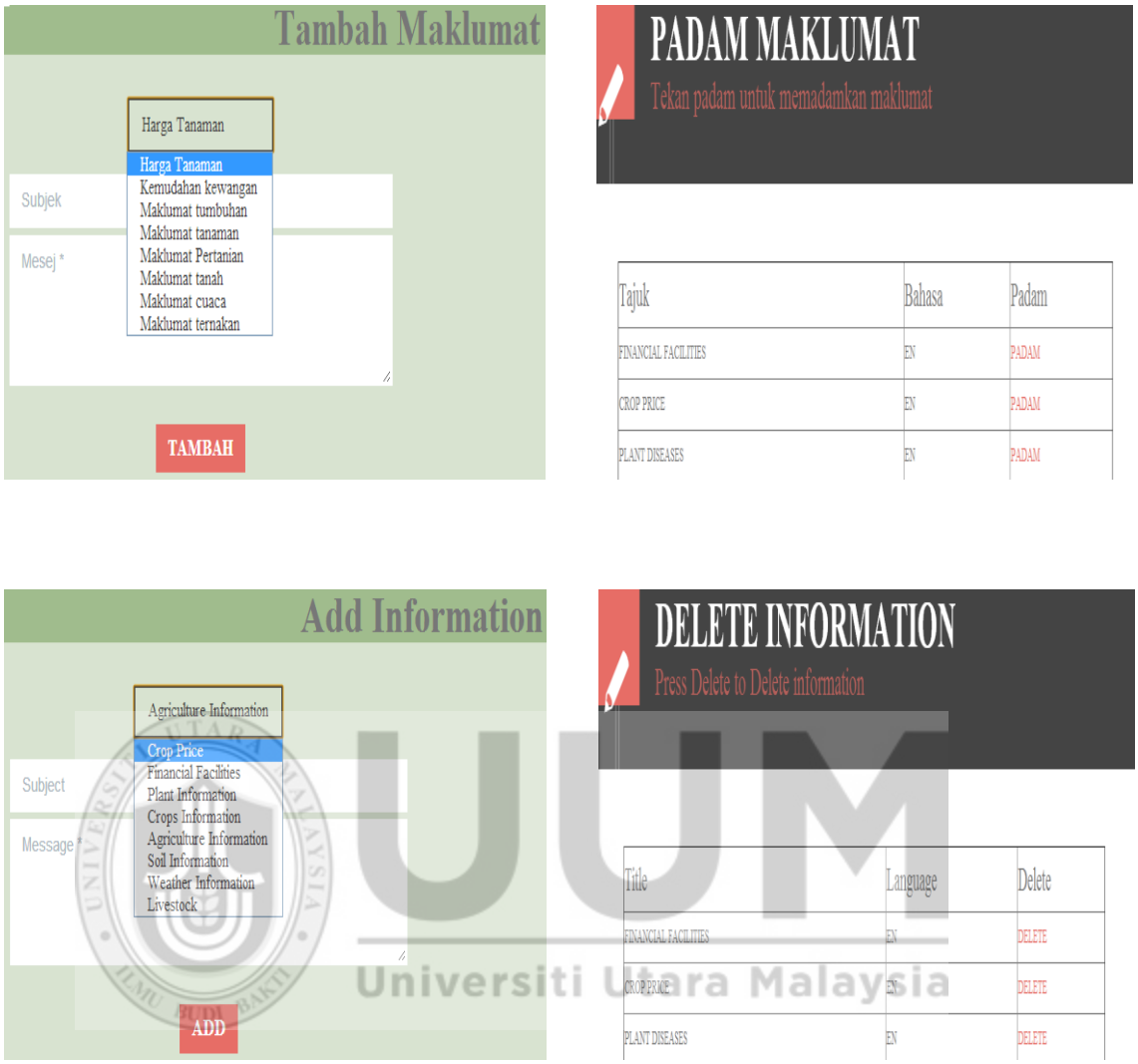

Figure 5.6: Manage INRFK information page in Malay and English languages

5.2.6 Send Message Page

The send message (feedback) page of INRFK is illustrated in Figure 5.7. It is seen that the website could manage feedbacks about any problem faced by the users as well as adding any new information that is perceived as important to the INRFK in order to develop this website.

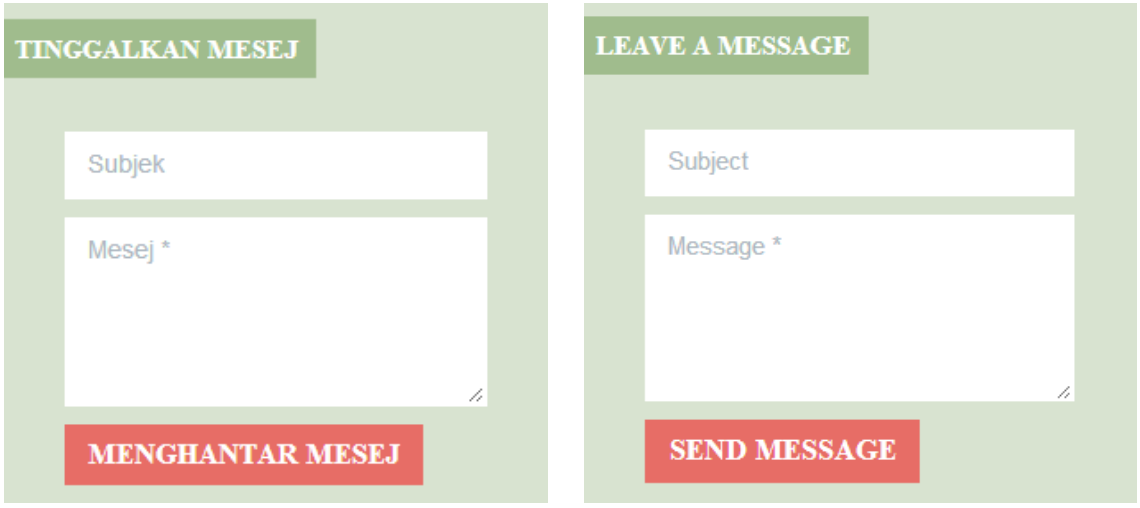

Figure 5.7: Send message page in Malay and English languages

5.2.7 Announcement Page

The page of announcement is represented by Figure 5.8. It can be recognized that the INRFK provided announcement service by the admin. This function allows the admin to create announcements relating to the services offered by the government and publish them in the website. Examples of such announcements may include the offering of new farming machines, new types of seeds, and latest agricultural tools with suitable prices in order to support the rural farmers.

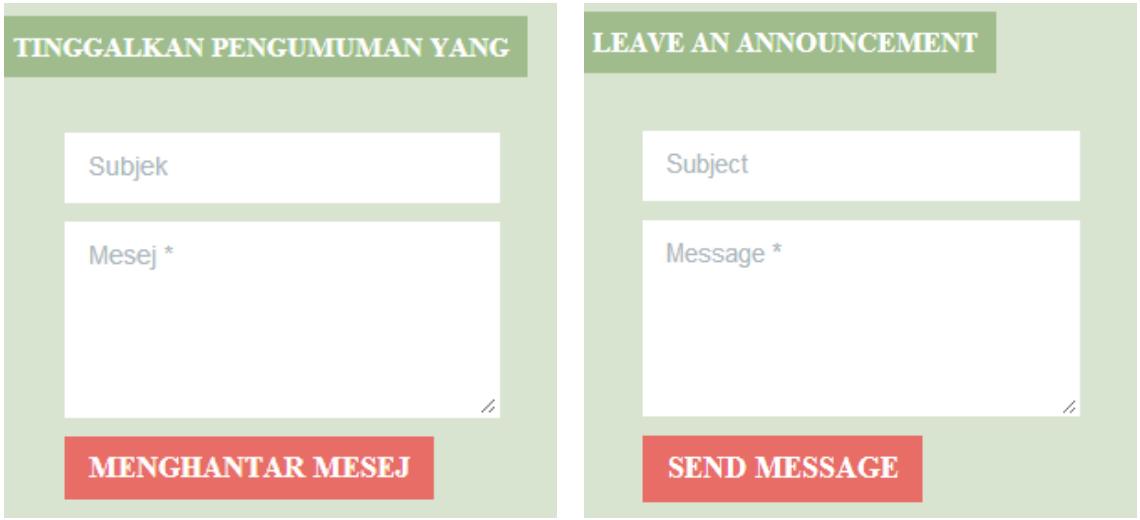

Figure 5.8: Announcement page in Malay and English languages

5.3 Evaluation of rural farmers' information needs

This section discusses the evaluation of the rural farmers' information needs that embodied in INRFK website contents, whether meet their needed, which is the third objective in this study. Before testing the usability, the functionality testing was important to ensure that the prototype worked as intended. The test case method was used to test the functionality of the INRFK website. Salih (2012) stated that a usability test is one of the fundamental methods in the evaluation. Since it is a real test, users were asked to use the product. The user performed the tasks in the user's interface.

Moreover, the objective of evaluating the users' satisfaction was to discover what the users think and feel about a proposed concept or the use of a product. Commonly, an evaluation has three goals, comparison, quality evaluation, as well as revealing the weaknesses of a particular concept or product (Abokhwt, 2012).

5.3.1 Procedure of Functionality Test

One of the methods that enabled the researcher to obtain the INRFK feedback was a test case method. During this testing, the prototype should work as desired. Therefore, it was carried out together with the functionality test. The testing has been prepared by the developer of the INRFK. The testing included all functions in the prototype (explained in section 5.4.1).

5.3.2 Procedure of User Usability Test

There is a necessary point to ensure that the rural farmers agreed in the usability of the INRFK and it is easily used (through providing the information that needed by the rural

farmers, as explained in Chapter 4). Therefore, the rural farmer's perceptions were related to the usefulness and easiness of the INRFK use. The study involved 30 rural farmers living in Kedah that were using the Pusat Internet Desa (PID) to perform their ICT related activities, to evaluate the rural farmers' information needs.

5.4 Results

The results obtained from the functionality and user usability tests are described in this section. Since they were carried out separately, those results were discussed separately as well. The results of the functionality test were explained first, followed by the usability test.

5.4.1 Results of the Functionality Test

This section discusses the functionality test of the INRFK. The functions in the INRFK were tested one by one to make sure that they worked correctly and the rural farmers were not distracted by any technical errors that would affect their experience. The main test case was to obtain information focusing on whether the INRFK succeed or failed. The next tables show the results of each function in the INRFK.

Table 5.1

Functionality of the register

Test Case One: Register process to INRFK	**Priority(H,L):** High
Test Objective: The process of register.	
Test Description: This test case explains the process of user registration, and the user filling in all the fields of information which are required for registration.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. The use case starts when the user clicks on the "Register" button. 2. The prototype displays the registration form. 3. The user fills the registration form. 4. The user submits this form by clicking the "Register" button.	
Actions: The entire fields are filled by the user.	**Expected Results:** The user registers in the INRFK and then login.
Pass: Yes	**Fail:** No.
Problem/ Issue: Nil.	
Notes: Successfully Executed.	

Table 5.2

Functionality of login

Test Case Two: The login process to the INRFK	**Priority(H, L):** High
Test Objective: The login process helps both the admin and users to perform their needs.	
Test Description: This test case explains the login process. The registered users can access into the prototype. Hence, authenticity filter is necessary.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case starts when the user clicks on the "Login" button. 2. The prototype displays the login page. 3. The user inputs his/her username and password. 4. The user submits the form by clicking on the "Login Now" button. 5. The prototype will open his/her account. • The user must have already registered and have username and password to login to the INRFK.	
Actions: The user must enter the username and password correctly.	**Expected Results:** After verifying the username and password the user logs in the INRFK.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.3

Functionality of change language

Test Case Three: Change language	**Priority(H, L):** Low
Test Objective: Language selection shows the possibility of access to information.	
Test Description: Change language page of INRFK from Malay to English or vice versa.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case starts when the admin and user select the language. 2. The user can press on "MY" button for the Malay language, or press "EN" button for the English language. 3. The prototype will show the page in the selected language.	
Actions: The button of change language should change the INRFK page language to Malay/English.	**Expected Results:** The language of INRFK will be changed to the selected language.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.4

Functionality of change font size and color

Test Case Four: Change font size and color	**Priority(H, L):** Low
Test Objective: Font size and color selection shows the possibility of viewing the INRFK pages in new styles.	
Test Description: Change the INRFK pages to view them with different font size and color.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case starts when the admin and user select the "Font Size and Color" button. 2. The prototype will show the available font size and color. 3. The user can select the font and color. 4. The prototype will display the page in the selected font size and color.	
Actions: The button of change font size and color should change the font or color of the INRFK page.	**Expected Results:** The font and color of the INRFK page will be changed to the selected form.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.5

Functionality of download document

Test Case Five: Download document	**Priority(H, L):** High
Test Objective: The user downloads the desired information from the INRFK.	
Test Description: This test case explains the download document process. The user can download the information that is available in the INRFK and save it in his/her device.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case begins when the user press on the "Display Information" button. 2. The prototype will show the display information page. 3. The user can select the desired information and then press "Download" button. 4. The prototype will download the information. 5. The user can save it in his/her device.	
Actions: The user downloads the information from the INRFK.	**Expected Results:** The desired information is downloading from the INRFK.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.6

Functionality of display information

Test Case Six: Display information	**Priority(H, L):** High
Test Objective: Display page of the available information in the INRFK.	
Test Description: The test case six explains the viewing process. All the information can be viewed by the users.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. The use case starts when the user presses on the "Display Information" button. 2. The prototype will display the information page. 3. The user can choose the information that he/she needs. 4. The prototype will show this information.	
Actions: The user can see all the information in the system.	**Expected Results:** The information is viewed by the user.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.7

Functionality of edit profile

Test Case Seven: Edit profile	**Priority(H, L):** High
Test Objective: Editing the phone number, email, and so on, by the user.	
Test Description: This test case explains the edit profile process, the user changes his/her information and saves it in the database.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case begins when the user presses on the "Profile" button. 2. The prototype will show the profile page. 3. The user edits his/her information and presses "Update" button. 4. The prototype will upload the updated information and save it in the database.	
Actions: The user edits his/her profile in INRFK.	**Expected Results:** The user's profile is edited in the INRFK and saved in the database.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.8

Functionality of send message

Test Case Eight: Send message	**Priority(H, L):** High
Test Objective: Send message (feedback) between the user and admin.	
Test Description: This test case explains the feedback process. All the users and administration can send messages.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case starts when the user chooses "Send Message" button. 2. The prototype will display send message page. 3. The user can write the message, and then press "Send Message" button. 4. The prototype will upload this message and send it to the admin. 5. The admin can reply to this message.	
Actions: The user clicks send message button.	**Expected Results:** The message is sent and uploaded.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.9

Functionality of manage INRFK information

Test Case Nine: Manage INRFK information	**Priority(H, L):** High
Test Objective: Add and delete the information in the INRFK.	
Test Description: The managing information process is explained in this test case as add and delete tasks.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. The use case starts when the admin wants to update the INRFK information by selecting the "Manage INRFK Information" button and pressing on "Add" or "Delete" button. 2. The prototype will open add or delete page as he/she has chosen. 3. The admin can add the desired information and press "Add" button, and he/she can delete the information by selecting the desired information and then pressing "Delete" button. • The admin must be authorized to manage the INRFK information.	
Actions: The admin select the manage INRFK information button.	**Expected Results:** The information in the INRFK is updated and saved in the database.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.10

Functionality of announcement

Test Case Ten: Announcement	**Priority(H, L):** High
Test Objective: The admin creates announcement and publish it in the INRFK.	
Test Description: This test case explains the generation of announcement process. The admin can send and upload the announcement in the INRFK.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case starts when the admin presses on the "Send Message" button. 2. The prototype will show the send message page which includes the announcement field. 3. The admin can select this field and write his/her announcement and then press "Send Message" button. 4. The prototype will upload the announcement and then save it in the database of the INRFK.	
Actions: The admin writes and uploads the announcement.	**Expected Results:** The announcement is uploaded and published to the INRFK members.
Pass: Yes	**Fail:** No
Problem: Nil.	
Notes: Successfully Executed.	

Table 5.11

Functionality of logout

Test Case Eleven: Logout	**Priority(H, L):** High
Test Objective: The admin and user can logout from the INRFK.	
Test Description: When the user finishes all his/her tasks, he/she can logout.	
Requirements verified: Yes.	
Test environment: Windows 7, Google chrome browser.	
Test step/Pre Condition: 1. This use case starts when the admin and user clicks on the "Logout" button. 2. The prototype closes his/her account. The user is logged out of the system.	
Actions: The admin and user chooses the logout button.	**Expected Results:** The user exited from the prototype.
Pass: Yes **Fail:** No	
Problem: Nil.	
Notes: Successfully Executed.	

Having accomplished the development of the INRFK, the study is now directed to evaluate the product. Therefore, at this stage, the INRFK is tested via the functionality test for each function and filled in all the test case information. As shown in Tables 5.1 to 5.11, the evaluation results reveal that the INRFK is working correctly without any errors. Moreover, it has good performance and high quality.

The results show that nearly all the users could register into the INRFK as well as to login. Meanwhile, it is found that all the users can explore the information with high easiness. The results pointed out that the user was able to change the language, font size, and pages color. Other findings clarified that the user and admin were able to send and receive message (feedback) easily. Concerning the information management in the INRFK, it is found that it was performed properly; the admin could change and manage the information in the INRFK perfectly. Moreover, the edit profile and download documents also were under user's control.

Based on the above, the findings show that nearly all the users and admin were able to perform their tasks. In addition, to support user's task, all the functions in INRFK were appropriately worked as proved by the previous findings. As well as, the users can access to the INRFK from anywhere and in anytime.

5.4.2 Results of the User Usability Test

The test of user usability started with the general information section about the respondents followed by perceived usefulness. In this testing, the users believed that the use of a particular website would enhance his/her job performance according to the information that available in this website. As well as, perceived ease of use that reflected the degree to which the users believed that the use of a particular website would be free of effort. These results are discussed under the following subheadings:

- Profile of Respondents.
- Usefulness and Ease of Use.

5.4.2.1 Profile of Respondents

This section focuses on the general information of the respondents. Table 5.12 indicates the gender, age, and level of education. As illustrated in this table, male respondents were 56.7% higher than female 43.3%. Regarding respondents' age, most of them were 25 to 34 represented by 50%; followed by 35 to 44 by 20%; less than 18 by 13.3%; 45 to 54 were 10%; and 18 to 24 represented by 6.7%, namely only two respondents. In relation to their educational background, most of them were having high school level by 43.3%; Bachelor degree by 26.7%; followed by 23.3% having Diploma; and finally, 6.7% have Pre-university education.

Table 5.12

Respondents' data summary

Gender	**Frequency**	**Percentage**
Male	17	56.7%
Female	13	43.3%
Age		
Less than 18	4	13.3%
18-24	2	6.7%
25-34	15	50%
35-44	6	20%
45-54	3	10%
Level of Education		
Secondary school	13	43.3%
Pre university education	2	6.7%
Diploma	7	23.3%
Bachelor degree	8	26.7%

Concerning the farming sector, the results shown in Table 5.13 revealed that most respondents worked in paddy sector by 56.7% reflecting the nature of Kedah as being well-known for rice cultivation. Then, 20% of them worked in the rubber sector; where as 13.3% worked in palm oil sector. Actually, only three respondents were working in livestock sector represented by 10%.

Table 5.13

Farming sector

Sector	Frequency	Percentage
Rubber	6	20%
Paddy	17	56.7%
Palm oil	4	13.3%
Livestock	3	10%
Total	30	100%

Tables 5.12 and 5.13 indicate the rural farmers' profiles who were involved in the evaluation of the INRFK website.

5.4.2.2 Usefulness and Ease of Use

After completing the first section of the questionnaire, the respondents were asked about their opinions regarding the usefulness and easiness of the INRFK. Likert scale was utilized for each question ranging from 1 (strongly disagree) to 5 (strongly agree) (see appendix B).

A. Perceived Usefulness

The usefulness aspect measures the degree to which a respondent believed that using the INRFK would enhance his/her job performance (Q. A. Ali, 2012; Davis, 1993). The results of this aspect are discussed in this section, each question is detailed separately. Table 5.14 illustrates the result of measuring the perceived information in relevance to the rural farmers' needs. As shown in this table, the respondents who agreed on its relevance were 50%, strongly agreed by 23.3%; and 26.7% were Neutral.

Table 5.14

Perceived Usefulness - Question 1

Q1. The information in the website was relevant to me.

	Scale	Frequency	Percentage
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	8	26.7%
	Agree	15	50%
	Strongly Agree	7	23.3%
	Total	30	100%

The answers to the second question were summarized in Table 5.15. This table shows results in relation to the understandability of information provided in INRFK website. Therefore, 36.7% of the respondents agreed on its understandability corresponding to strongly agree scale by 36.7% too, while neutral scale was represented by 26.7%. These results showed that the provided information in this website was understandable by the rural farmers.

Table 5.15

Question 2

Q2. The website provides understandable information.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	8	26.7%
	Agree	11	36.7%
	Strongly Agree	11	36.7%
	Total	30	100%

The results shown in Table 5.16 revealed that 53.3% of respondents agreed on the accuracy of information provided in this website; followed by 30% for neutral; and then 16.7% for strongly agree.

Table 5.16

Question 3

Q3. The website provides accurate information.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	9	30%
	Agree	16	53.3%
	Strongly Agree	5	16.7%
	Total	30	100%

On the other hand, the fourth question concerned with the information usability. The answers are summarized in Table 5.17. According to those answers, 13.3% of respondents were neutral compared with the highest number of respondents by 53.3% for agree and 33.3% for strongly agree with the usability of this information.

Table 5.17

Question 4

Q4. The website provides usable information.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	4	13.3%
	Agree	16	53.3%
	Strongly Agree	10	33.3%
	Total	30	100%

Furthermore, the fifth question was related to that the current website provided complete information to enhance the rural farmers improving their knowledge. Based on the results shown in Table 5.18, 43.3% of the respondents agreed on its completeness; strongly agreed by 23.3%, and 33.3% for neutral.

Table 5.18

Question 5

Q5. The website provides complete information.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	10	33.3%
	Agree	13	43.3%
	Strongly Agree	7	23.3%
	Total	30	100%

The information accessibility in INRFK website was the concern of question six. The results in Table 5.19 revealed that the highest rank was for agree scale by 36.7% of total respondents; followed by 33.3% for neutral; and then 30% for strongly agree that the information provided by this website was accessed appropriately.

Table 5.19

Question 6

Q6. Information from the website is well accessible.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	10	33.3%
	Agree	11	36.7%
	Strongly Agree	9	30%
	Total	30	100%

In relation to task managing, question seven was focused on the role of INRFK website to provide an effective task management for the rural farmers. According to the results presented in Table 5.20, it is clear that more than 86% was for agreement scale, including agree by 60% and strongly agree by 26.7%, that this website enabled the rural farmers to better manage their tasks. However, 13.3% was for neutral.

Table 5.20

Question 7

Q7. I can manage my tasks better with this website.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	4	13.3%
	Agree	18	60%
	Strongly Agree	8	26.7%
	Total	30	100%

Consistent with the results illustrated in Table 5.21, it is asserted that slightly above 63% of the respondents agreed on that the information was timely provided in this website; 23.3% were strongly agree; whereas only 13.3% was for neutral.

Table 5.21

Question 8

Q8. The website provides timely information.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	4	13.3%
	Agree	19	63.3%
	Strongly Agree	7	23.3%
	Total	30	100%

Regarding job performance, the improvement of farmers' job performance by INRFK website was measured in the ninth question. Consistent with the analyzed results shown in Table 5.22, 46.7% represented those respondents who agreed on the website role in improving their job performance; then 33.3% for strongly agree; but there were 20% of them viewed it as neutral.

Table 5.22

Question 9

Q9. Using the website improves my job performance.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	6	20%
	Agree	14	46.7%
	Strongly Agree	10	33.3%
	Total	30	100%

Based on the results illustrated in Table 5.23, it is noticed that around 77% of the respondents agreed (including 60% for agree and 16.7% for strongly agree), realized that the INRFK website aided them to access the desired information, meaning that the website was designed in line with the rural farmer's needs; while 23.3% of them regarded it as neutral.

Table 5.23

Question 10

Q10. The website aids my access to the information I need.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	7	23.3%
	Agree	18	60%
	Strongly Agree	5	16.7%
	Total	30	100%

Generally, the website must have trusted information; hence, question eleven focused on the respondents' viewpoints regarding the trusted information offered in INRFK website. A large number of the respondents, exactly 50%, agreed on this part; fairly less than 27% represented strongly agree; however, 23.3% was for neutral. As shown in Table 5.24.

Table 5.24

Question 11

Q11. The website provides trusted information.			
	Scale	**Frequency**	**Percentage**
Usefulness	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	7	23.3%
	Agree	15	50%
	Strongly Agree	8	26.7%
	Total	30	100%

B. Perceived Ease of use

This section included the discussion of the INRFK website in terms of use easiness; this referred to the degree to which a person who intended to use this website believed that it would be free of effort (Davis, 1989). Questions twelve to twenty were emphasized on the farmer's opinion in the INRFK website in relation to the use easiness.

As shown in Table 5.25, the results revealed that there is a similarity concerning the INRFK website simplicity by 86.6%, divided into 43.3% agree and 43.3% strongly agree; contrary to 13.3% represented neutral.

Table 5.25

Perceived Ease of use - Question 12

Q12. It is easy to use.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	4	13.3%
	Agree	13	43.3%
	Strongly Agree	13	43.3%
	Total	30	100%

The results in Table 5.26 represented the opinions of rural farmers concerning the easiness of the INRFK website learning. Consequently, 50% of the respondents agreed; strongly agree by 36.7%; and then 13.3% was neutral.

Table 5.26

Question 13

Q13. It is easy to learn.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	4	13.3%
	Agree	15	50%
	Strongly Agree	11	36.7%
	Total	30	100%

According to the results shown in Table 5.27, it is noticeable that most respondents, exactly 50%, agreed on that the interface was pleasant and attractive; 30% strongly agree; and 20% was neutral.

Table 5.27

Question 14

Q14. The interface of the website is pleasant.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	6	20%
	Agree	15	50%
	Strongly Agree	9	30%
	Total	30	100%

The results shown in Table 5.28 indicated that the top ranked scale was for agree by around 47% that the website design was friendly to the user; followed by 33.3% for strongly agree; besides, 20% for neutral.

Table 5.28

Question 15

Q15. The website layouts are user friendly.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	6	20%
	Agree	14	46.7%
	Strongly Agree	10	33.3%
	Total	30	100%

The main buttons/links of the website interface should be simple, consistent and intuitive to attract users' attention. This aspect in relation to the current website was regarded in question sixteen and the results were summarized in Table 5.29. It was agreed upon by 53.3% of total respondents saying that all buttons/links were functioning well and simple in use. The respondents who supported this aspect by strongly agree were 36.7%, while the neutral was represented by 10%.

Table 5.29

Question 16

Q16. All the buttons/links are functioning well.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	3	10%
	Agree	16	53.3%
	Strongly Agree	11	36.7%
	Total	30	100%

Furthermore, the question seventeen focused on the easily interaction of rural farmers with the INRFK website. The results were shown in Table 5.30. The highest number of respondents represented by around 47% for agree; and 33.3% for strongly agree; while neutral was represented by 16.7%; however, only one respondent said disagree represented by 3.3%.

Table 5.30

Question 17

Q17. I interact with this website easily.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	1	3.3%
	Neutral	5	16.7%
	Agree	14	46.7%
	Strongly Agree	10	33.3%
	Total	30	100%

The rural farmers should always use the INRFK website successfully in managing their job to see whether they remember the way of its use or not. Therefore, question number eighteen dealt with this aspect. The results analysis, as shown in Table 5.31, clarified that most respondents were always using it successfully to obtain the information related to their activities; particularly 40% agree and 33.3% strongly agree; contrary to 26.7% was neutral.

Table 5.31

Question 18

Q18. I can use it successfully every time.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	8	26.7%
	Agree	12	40%
	Strongly Agree	10	33.3%
	Total	30	100%

The results shown in Table 5.32 are related to the question nineteen which was about whether the INRFK website provided easy ways to find the desired information or not. It is noticed that the respondents who agreed on this aspect were 30%; while those who strongly agreed were 46.7%; 20% of the respondents were neutral; and only one respondent disagreed represented by 3.3%.

Table 5.32

Question 19

Q19. It is easy to find the information I needed.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	1	3.3%
	Neutral	6	20%
	Agree	9	30%
	Strongly Agree	14	46.7%
	Total	30	100%

Finally, question twenty was related to the rural farmers' ability of using the INRFK website by themselves without others' help. Table 5.33 contained the results of this question. According to these results, most the respondents were able to use this website by themselves without others' help, namely 46.7% agree and 36.7% strongly agree. However, 16.7% of the respondents were neutral.

Table 5.33

Question 20

Q20. I can use it by myself without any help.			
	Scale	**Frequency**	**Percentage**
Ease of use	Strongly Disagree	0	0%
	Disagree	0	0%
	Neutral	5	16.7%
	Agree	14	46.7%
	Strongly Agree	11	36.7%
	Total	30	100%

After examining all the questions in this section, the mean score for each question was investigated. The results were shown in Tables 5.14 to 5.33. They revealed that the mean score for each question was high ranging from 3.68 to 4.30. Conversely, the standard deviations were examined as well. They represented a small value which was less than one. This means that the respondents were agreed with the questions regarding the INRFK website.

Table 5.34 illustrated the descriptive statistics of the 20 items questionnaire that were answered by the respondents regarding the usefulness and easiness of using the INRFK website. It is clearly seen that most of the respondents were pleasant with using the INRFK website who answered the questions with (agree and strongly agree), they represented high mean score =4.30 and standard deviation = 0.702. On the other hand, some of the respondents were less comfortable in using the INRFK website, they represented mean score = 3.68 and standard deviation = 0.681.

Table 5.34

Descriptive Statistics

Questions	N	Minimum	Maximum	Mean	Std. Deviation
Q1	30	3	5	3.96	.718
Q2	30	3	5	4.10	.803
Q3	30	3	5	3.68	.681
Q4	30	3	5	4.20	.664
Q5	30	3	5	3.90	.758
Q6	30	3	5	3.96	.808
Q7	30	3	5	4.13	.628
Q8	30	3	5	4.10	.607
Q9	30	3	5	4.13	.730
Q10	30	3	5	3.93	.639
Q11	30	3	5	4.03	.718
Q12	30	3	5	4.30	.702
Q13	30	3	5	4.23	.678
Q14	30	3	5	4.10	.711
Q15	30	3	5	4.13	.730
Q16	30	3	5	4.26	.639
Q17	30	2	5	4.10	.803
Q18	30	3	5	4.06	.784
Q19	30	2	5	4.20	.886
Q20	30	3	5	4.20	.714

5.5 Reliability

One of the most commonly used reliable coefficients is that of Cronbach's Alpha. Thus, Cronbach's alpha value was calculated using SPSS version 20 to determine the data inter item reliability. Therefore, the measurement was conducted 20 items and obtained

(0.958). The total reliability statistics of the usefulness and easiness of use were presented in Table 5.35.

Table 5.35

Reliability result

Cronbach's Alpha	N of Items
.958	20

5.6 Summary

The development phase of the INRFK website was described in this chapter. Firstly, the website was represented by a number of processes in relation to the desired objectives. Hence, the website was illustrated by using snapshots related to its main steps. The functionality test and user usability test were utilized to evaluate this website. The evaluation results were reliable, i.e. they proved that the website supported the rural farmers' needed requirements in Kedah, Malaysia. In addition, the rural farmers regarded the website as useful and simple; therefore, it enabled them to obtain the information that relevant to their needs, and they acquire more knowledge and skills in activities related to the farm management.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter begins with the achieved objectives, which are including information needs of the rural farmers, prototype development, and information needs evaluation. Then, it discusses the problems and limitations of specific study, and also suggestions for future research in rural farmers' information needs.

6.2 Achieved Objectives

The main objectives were to identify the rural farmers' information needs, followed by developing a prototype based on the obtained information, and finally, to evaluate the rural farmers' information needs. The following are discussions that focused on these objectives.

6.2.1 Information Needs of the Rural Farmers

This researcher identified the information needs of the rural farmers in Kedah. Based on the findings, their needed information were represented by: soil classification, crop varieties, crop husbandry, irrigation, agricultural tools, livestock feeding, livestock husbandry, financial facilities, harvest management, weather information, farm preparations, soil fertilization, crop price, agriculture marketing, crops store, livestock diseases, plant diseases, pest management, weeding, and seed variety, as described in Chapter 4. Evidently, data analysis revealed that most rural farmers in Kedah required information concerning agriculture marketing, pest management, soil fertilization, seed

variety, and harvest management. This resembled the findings of Akanda and Roknuzzaman's (2012) study which identified various aspects where the Bangladeshi rural farmers require information in order to improve their productivity, such as modern cultivation system, seeds and planting materials, diseases and pest management, manure and fertilizer management, soil and water conservation, government schemes on agriculture, harvest techniques and market information. These findings indicate the importance and usefulness of the mentioned information for most of the rural farmers in their works, especially in managing their related activities.

Moreover, the findings of this study have similarities with those of other studies, particularly studies of Naveed and Anwar (2013); Omoregbee and Banmeke (2014). Naveed and Anwar reported that the Pakistani rural farmers need information such as Soil/plot preparation, preparation of seeds, taking care of the crops, harvesting activities, and animal husbandry. As well as, Omoregbee and Banmeke expressed the findings of other similarity in information that needed by the rural farmers in Delta, Nigeria like land preparation, fertilizer application, and weed control. We conclude from these similarities in some of the findings, that there are common factors in various places such as the nature of the land, and nature of the climate have made the rural farmers need the same information.

On the other hand, the current findings differed from other related studies. That is, Shaifuddin et al. (2009) mentioned that the information needed by the rural farmers in Selangor, Malaysia includes health and job opportunities, rural development program, academy, law, cattle farming, agricultural extension and advisory services. While,

Sharma (2014) stated that the rural farmers in Madhya Pradesh, India require information such as technical information, marketing information, social information and legal information. In fact, these different in the findings caused by environmental variations and daily problems faced by the rural farmers.

6.2.2 Prototype Development

Inappropriate or poor quality of information could be a difficulty to the rural farmers' use of information source. Therefore, the second objective focused on developing a prototype based on the information needed by the rural farmers. The prototype was designed with a format that can be understood by the rural farmers through providing the local language to enhance the readability of the website contents. Accordingly, this could improve the rural farmers' knowledge and make them managing their farming activities, as well as promoting the learning process in the rural communities.

In addition, the INRFK website included the service of message sending that assisted the rural farmers in Kedah, i.e. they could contact the administration of Pusat Internet Desa (PID) through the use of this service without having to visit it physically. Hence, the designed web contents of information system were presented to serve the rural farmers in Kedah, since they considered it as a useful and positive contribution. Finally, if the current efforts along with a sufficient investment are paid attention, the rural farmers' activity will improve because those rural farmers are striving for better knowledge.

6.2.3 Information Needs Evaluation

Regarding the third objective, it was to evaluate the rural farmers' information needs. Based on the results, it can be concluded that most of the rural farmers in Kedah believed that the prototype is useful and rich with information that are related to their needs. Particularly, more than 70% of the total respondents agreed on that this product provided understandable, accurate, and reliable information. Most of those respondents around 87% have positively evaluated and supported the obtained information and considered it usable and timely provided information. Based on the above, the results of information needs evaluation reflected that the rural farmers in Kedah feel the benefit through using such information, especially in managing the farming related activities, and considered it as a useful and positive contribution.

6.3 Problems and Limitations

As a foreign student, Malay language was a challenge for the researcher since it represented the local language of the selected sample of respondents that related to the rural farmers in Kedah, Malaysia. In fact, only some of those respondents could read and speak English; therefore, all questionnaire items concerning the identified requirements and evaluation were translated into Malay language to be understood by the respondents. The difficulty of prototype designing in both languages, namely Malay and English, represented another challenge for the researcher. Moreover, another problem was the difficulty of finding the adequate number of respondents to determine the requirements and evaluate the obtained information in the current study.

This study involved only one state in the Northern region of peninsula Malaysia. Hence, the findings could not be generalized to all the Malaysian states. Furthermore, the limited time to do more in-depth study is another challenge related to collect the complete information and recognize ways of its analysis. Finally, regarding the sample size of data collection, this study involved only 187 respondents, the study will obtain more information if the number of respondents was more than this sample size.

6.4 Future Work

The present study has accomplished its desired objectives concerning the rural farmers' information needs in Kedah, Malaysia. A lot of effort has been made to determine the information needs of the rural farmers and develop an appropriate prototype based on the obtained information. However, there are few recommendations and suggestions that need to be considered for the future work as follows:

1. More than one state can be included so as to identify other requirements of the rural farmers in various Malaysian states.
2. The mixed method of data collection and analysis would make the discussion more reliable because it can provide more elaborated findings. Hence, the interview and observation of the rural farmers should be taken into account in the future studies.
3. The usability and functionality of prototype may be enhanced by its contents. Thus, the obtained information other than those regarded in the current study can be utilized in the prototype development in relation to, for example, the rural farmers' livelihood.

4. Knowledge can be constructed within the social and scientific paradigms. Thus, it is recommended that an encouraging environment should be created in the communities to enable individual farmers and groups to share their knowledge and conduct their local experiments or test the new knowledge in the social paradigm. The village leaders and knowledge mediators in a particular area can create an encouraging environment for the communities to test new things by using certain factors, as proposed by Lwoga (2009), such as rewarding the communities when they take risks and test new ideas, promoting a positive attitude towards change, and tolerating mistakes.

6.5 Summary

This chapter discussed the findings of this study and compared it with the findings of other studies. The conclusions were presented based on the objectives of study. The problems and limitations of the study were also presented, and some suggestions for future works were also listed to enhance the findings of this study. Majority of the rural farmers do not have access to most of the required agricultural information. Therefore, the application of ICT based on agricultural information support system can facilitate access to the required information, improve the activities of the rural farmers, and the conveyance of online public services. Finally, the researcher obtained the rural farmers' information needs and developed appropriate website based on this obtained information, which represented a significant contribution to serve the rural farmers in Kedah.

References

AbdulWahab, L. (2012). *A Modified of the Unified Theory of Acceptance and Use of Technology (UTAUT) from Users' Perspective of Telecentre in Nigeria.* Unpublished Doctoral Thesis, Universiti Utara Malaysia, Malaysia.

Abokhwt, A. M. S. (2012). *Web Based Telecenter Training Management System at Yevern Region in Libya (WBTTMS).* Unbublished Master Thesis, Universiti Utara Malaysia, Malaysia.

Abuzwida, B. R. (2008). *Requirement Model For Mobile Bus Rental And Reservation Application.* Unpublished Master Tesis, Universiti Utara Malaysia, Malaysia.

Akanda, A. E. A. & Roknuzzaman, M. (2012). Agricultural Information Literacy of Farmers in the Northern Region of Bangladesh. *Information and Knowledge Management*, 2(6), pp. 1-11.

Al-Taie, M. Z.& Kadhim, A. M. (2013). *Factors Disrupting a Successful Implementation of E-Commerce in Iraq.* Paper presented at the Proceedings of the 4th Scientific Conference held in Baghdad, Iraq, pp. 1-14.

Ali, J. & Kumar, S. (2011). Information and Communication Technologies (ICTs) and Farmers' Decision-Making Across the Agricultural Supply Chain. *International Journal of Information Management*, 31(2), pp. 149-159.

Ali, Q. A. (2012). *Educational Painter for Preschool Children.* Unbublished Master Thesis, Universiti Utara Malaysia, Malaysia.

Alias, N. A., Jamaludin, H., Hashim, S., Ismail, I., & Suhaili, N. (2010). Theories of Change and Evaluation of Malaysian Rural Internet Centers. *Proceedings of IPID Postgraduate Strand at ICTD 2010* London, pp. 5-9.

Alorfi, A. S. M. (2012). *Web Based Online Volunteer Trainer System (OVTRS).* Unpuplish Master Thesis, Universiti Utara Malaysia, Malaysia.

Alzughoul, M. A. H. (2010). *Usability Evaluation of Web-based Online Airline Booking System.* Unpuplished Master Thesis, Universiti Utara Malaysia, Malaysia.

Ariff, M. S. M., Yan, N. S., Zakuan, N., Ishak, N., & Ismail, K. (2013). Web-Based Factors Influencing Online Purchasing in B2C Market; View of ICT Professionals. *Review of Integrative Business & Economics*, 2(2), pp. 572-586.

Azarian, Z. S., Hassan, M. S., & Abu Samah, B. (2012). Gratification Obtained from Agricultural Information Disseminated through Radio among Malaysian Farmers. *Journal of Basic and Applied Scientific Research*, 2(11), pp. 11711-11716.

Babu, S. C., Glendenning, C. J., Okyere, K. A., & Govindarajan, S. K. (2012). Farmers' Information Needs and Search Behaviors. International Food Policy Research Institute, Paper 01165, pp. 1-37.

Bailey, A. (2009). Issues Affecting the Social Sustainability of Telecentres in Developing Contexts: A Field Study of Sixteen Telecentres in Jamaica. *The Electronic Journal of Information Systems in Developing Countries*, 36(4), pp. 1-18.

Bakar, A. B. A. (2011). Information Seeking Behaviours of Rural Women in Malaysia. *Library Philosophy and Practice (e-Journal)*, Paper 461.

Bashir, M. S., Samah, B. A., Emby, Z., Badsar, M., Shaffril, H., & Aliyu, A. U. (2011). Information and Communication Technology Development in Malaysia: Influence of Competency of Leaders, Location, Infrastructures and Quality of Services on Telecentre Success in Rural Communities of Malaysia. *Australian Journal of Basic and Applied Sciences*, 5(9), pp. 1718-1728.

Bevacqua, A., Carnuccio, M., Ortale, R., & Ritacco, E. (2011). *A New Architectural Paradigm for Content-Based Web Applications: Borè.* Paper presented at the Proceedings of the 15th Symposium on International Database Engineering and Applications, 21-27 September 2011, Lisbon, Portugal, pp. 192-196.

Brooke, J. (1996). SUS-A Quick and Dirty Usability Scale. *Usability evaluation in industry*, 189(194), pp. 4-7.

Buhigiro, S. (2013). *The Role of Telecentres in Promoting Socio-Economic Development in Rwanda.* Master Thesis, University of the Witwatersrand, South Africa.

Cheang, S.& Lee, J. D. (2010). *Evaluation Telecentre Performance in Social Sustainability Context: A Cambodia Case Study.*Paper presented at the Proceedings of the 6th International Conference on Advanced Information Management and Service (IMS), Seoul: IEEE Explore, pp. 135-141.

Chen, Z., Ling, K. C., Ying, G. X., & Meng, T. C. (2012). Antecedents of Online Customer Satisfaction in China. *International Business Management,* 6(2), pp. 168-175.

Chisita, C. T.& Malapela, T. (2015). Towards Mobile Agricultural Information Services in Zimbabwean Libraries: Challenges and Opportunities for Small Sacle Farmers in Utilizing ICTs for Sustainable Food Production. *Agricultural Information Worldwide,* 6, pp. 58-65.

Coakes, S. J., & Steed, L. (2009). *SPSS: Analysis without anguish using SPSS version 14.0 for Windows*: John Wiley & Sons, Inc.

Conroy, C. (2006). Telecentre Initiatives in Rural India: Failed Fad or the Way Forward? *Natural Resources Institue, University of Greenwich*, pp. 2-30.

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage publications, pp. 3-26.

Daradkeh, M. M. M. (2010). *Development of Online Advertising System for Supporting Training Course (DOASFSTC).*Unpublish Master Thesis, Universiti Utara Malaysia, Malaysia.

Das, A. K.& Dutta, C. (2004). Strengthening Rural Information Infrastructure through E-Choupals. *XXI IASLIC National Seminar, Kolkata*, pp. 1-6.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *Management Information Systems Research Center*, 13(3), pp. 319-340.

Davis, F. D. (1993). User Acceptance of Information Technology: System Characteristics, User Perceptions and Behavioral Impacts. *International journal of man-machine studies,* 38(3), PP. 475-487.

Dervin, B. (1998). Sense-Making Theory and Practice: An Overview of User Interests in Knowledge Seeking and Use. *Journal of Knowledge Management,* 2(2), pp. 36-46.

Dey, B. L., Prendergast, R., & Newman, D. (2008). How Can ICTs be Used and Appropriated to Address Agricultural Information Needs of Bangladeshi Farmers? *GlobDev 2008*. Paper 21.http://aisel.aisnet.org/globdev2008/21.

Dogara, M. A. (2011). *Information Requirement for Rural Development through Telecentre in Kaduna State, Nigeria.* Unpublished Master Thesis, Universiti Utara Malaysia, Malaysia.

Doshi, K.& Gollakota, K. (2011). Diffusion of Technological Innovations in Rural Areas. *The Journal of Corporate Citizenship,* (41), pp.69-77.

Dumas, J. S. & Redish, J. (1999). *A practical Guide to Usability Testing*: Intellect Books, England, pp. 22-38.

Duquennoy, S., Grimaud, G., & Vandewalle, J. J. (2009). *Serving Embedded Content Via Web Applications: Model, Design and Experimentation.* Paper presented at the Proceedings of the 7th ACM International Conference on Embedded Software, 11-16 October 2009,Grenoble, France, pp. 117-126.

Elizabeth, S. (2007). Agricultural Information Needs of Women Farmers in Mubi Region, Adamawa State. *Journal of Tropical Agriculture*, 45(1-2), pp. 69-71.

Elly, T. & Silayo, E. E. (2013). Agricultural Information Needs and Sources of the Rural Farmers in Tanzania: A Case of Iringa Rural District. *Library Review,* 62(8/9), pp. 547-566.

Garrido, M., Sey, A., Hart, T., & Santana, L. (2012). Literature Review of how Telecentres Operate and have an Impact on E-Inclusion.*Spain: European Commission Joint Research Centre of Prospective Technologies.* European Union, pp. 1-150.

Gliem, J. A. & Gliem, R. R. (2003). *Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-type Scales*. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, the Ohio State University, Columbus, OH, October 8-10, 2003, pp. 82-88.

Harande, Y. I. (2009). Information Services for Rural Community Development in Nigeria. *Library Philosophy and Practice (e-Journal)*, paper 271.

Harris, R. W., Yogeesvaran, K., & Lee, L. W. (2007). *Telecentres for National E-Inclusion in Malaysia*.Paper presented at theProceedings of Asian Telecentre Forum, 6-8 February 2007, Kuala Lumpur, Malaysia, pp. 1-12.

Hassan, M. A., Samah, B. A., Shaffril, H. A. M., & D'Silva, J. L. (2011). Perceived Usefulness of ICT Usage among JKKK Members in Peninsular Malaysia. *Asian Social Science,* 7(10), p 255.

Haubold, A. & Natsev, A. (2008). *Web-Based Information Content and its Application to Concept-Based Video Retrieval.* Paper presented at the Proceedings of the International Conference on Content-Based Image and Video Retrieval, Niagara Falls, Canada, pp. 437-446. ACM.

Hedberg, L. J. (2011). Telecentre For Community Development: Evaluation of the Tunjang Telecentre, Malaysia. *The Journal of Community Informatics,* 6(2). Available: http://ci-journal.net/index.php/ciej/article/view/412/601. Accessed: 1 aug 2015.

Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success, and Local Improvisations. *The Information Society,* 18(2), pp. 101-112.

Heshmati, A., Al Hammadany, F. H., &Mohammed, A. B. (2013). Analysis of Internet Usage Intensity in Iraq: An Ordered Logit Model. *Journal of Knowledge Management, Economics and Information Technology,* 3(3), pp. 1-21.

Hiltz, S. R. & Johnson, K. (1990). User Satisfaction with Computer-Mediated Communication Systems. *Management Science,* 36(6), pp. 739-764.

Huang, W., Li, R., Maple, C., Yang, H., Foskett, D., & Cleaver, V. (2008). *Web Application Development Lifecycle for Small Medium-Sized Enterprises (SMEs)(Short Paper).*Paper presented at the Proceedings of the 8th International Conference on Quality Software, held on 2-13 August 2008, Oxford, UK: IEEE Computer Society, pp. 247-252.

Huenerfauth, M. P. (2008). *Developing Design Recommendations for Computer Interfaces Accessible to Illiterate Users.* Master Thesis, National University of Ireland, Ireland.

Hughes, R. (2001). A Process Evaluation of a Website for Family Life Educators*. *Family Relations,* 50(2), pp. 164-170.

Ibrahim, H., Yusop, N. I., Dahalin, Z. M., Ghani, N. F. A., Yasin, A., & Kasiran, M. K. (2010). *Strategies for Information Communication and Technology (ICT) Adoption in Rural Areas*. Paper presented at the Proceedings of the5th

International Conference on Knowledge Management Theory, Research and Practice, 25-27 May 2010, Kuala Terengganu, Malaysia, pp. 7-13.

Isaya, E. L. (2015). *Sources of Agricultural Information for Women Farmers in Hai and Kilosa Districts, Tanzania.* Unpuplished Master Thesis, The Ohio State University, USA.

Israr, M., Jan, D., Ahmad, N., & Rahman, M. U. (2015). Women Health in Rural Pakistan in Millennium Development Goals Perspectives. *Journal of Poverty, Investment and Development,* 11, pp. 30-36.

Ivory, M. Y., & Hearst, M. A. (2001). The State of the Art in Automating Usability Evaluation of User Interfaces. *ACM Computing Surveys (CSUR),* 33(4), pp. 470-516.

Jalaluddin, A. M., Abdul, R. A., Mohd, M. A., & Alfitri, A. (2014). Symbiotic Relationship Between Telecentre and Lifelong Learning for Rural Community Development: A Malaysian Experience. *The Turkish Online Journal of Educational Technology,* 13(3), pp. 148-155.

Jawad, Z. M. (2014). *Modeling Technological Change on Telecentre Effectiveness.*Unpublished Master Thesis, Universiti Utara Malaysia, Malaysia.

Kabir, K. H. (2015). Attitude and Level of Knowledge of Farmers on ICT Based Farming. *European Academic Research,* 2(10), pp. 13177-13196.

Kanhabua, N., Niederée, C., & Siberski, W. (2013). *Towards Concise Preservation by Managed Forgetting: Research Issues and Case Study.* Paper presented at the Proceedings of the 10th International Conference on Preservation of Digital Objects, 2-5 September 2013, Lisbon, Portugal.

Kanny, E. (2014). *The role of communication tools in shopping centre management within the greater Durban area.* Unpuplish Master Thesis, Durban University of Technology, South Africa.

Khan, T. M. & Baig, M. R. (2013). Hospital Pharmacists' Knowledge About and Attitude Toward HIV/AIDS and Patients Living with HIV/AIDS in Kedah, Malaysia. *Archives of medical science: AMS,* 9(6), pp. 1117-1124.

Kim, H. J., Choi, J. K., & Ji, Y. (2008). *Usability Evaluation Framework for Ubiquitous Computing Device.* Paper presented at the Third International Conference on Convergence and Hybrid Information Technology, 2008. ICCIT'08.

King, H. J. & Jannik, C. M. (2005). Redesigning for Usability: Information Architecture and Usability Testing for Georgia Tech Library's website. *OCLC Systems & Services: International digital library perspectives,* 21(3), pp. 235-243.

Kirk, D. S. & Sellen, A. (2010). On Human Remains: Values and Practice in the Home Archiving of Cherished Objects. *ACM Transactions on Computer-Human Interaction (TOCHI),* 17(3), pp.1-43.

Kock, Y. D. (2010). *A communication Perspective on Change Management: ACase Study of the Government Communication and Information System (GCIS) in KwaZulu-Natal.*Unpuplish Master Thesis, Durban University of Technology, South Africa.

Lee, J.& Sparks, P. (2014). Sustaining a Nepali Telecentre: An Ethnographic Study using Activity Theory. *International Journal of Education and Development Using ICT,* 10(2), pp. 41-62.

Lin, L. Y.& Chen, C.S. (2006). The Influence of the Country of Origin Image, Product Knowledge and Product Involvement on Consumer Purchase Decisions: An Empirical Study of Insurance and Catering Services in Taiwan. *Journal of Consumer Marketing,* 23(5), PP. 248-265.

Lwoga, E. (2009). Application of Knowledge Management Approaches and Information and Communication Technologies to Mange Indigenous Knowledge in the Agricultural Sector in Selected Districts of Tanzania. Doctoral Thesis, University of KwaZulu-Natal, South Africa.

Mahmood, K. (2005). Multipurpose Community Telecentres for Rural Development in Pakistan. *The Electronic Library,* 23(2), pp. 204-220.

Mbangala, B.& Samzugi, A. (2014). The Role of Telecentres in Tanzania's Rural Development. The Case of Sengerema District Council, Mwanza Region. *Library Philosophy and Practice (e-Journal),* Paper 1169, pp. 1-26.

Meitei, L. S. & Devi, T. P. (2009). Farmers' Information Needs in Rural Manipur: An Assessment. *Annals of Library and information studies,* 56(1), PP. 35-40.

Meng, C. C., Samah, B. A., & Omar, S. Z. (2013). A Review Paper: Critical Factors Affecting the Development of ICT Projects in Malaysia. *Asian Social Science,* 9(4), pp. 42-50.

Mittal, S., Gandhi, S., & Tripathi, G. (2010). *Socio-Economic Impact of Mobile Phones on Indian Agriculture*. Indian Council for Research on International Economic Relations New Delhi, pp. 1-48.

Moomal, A.& Masrom, M. (2015). ICT Development and Its Impact on E-Business and HRM Strategies in the Organizations of Pakistan. *Journal of Advanced Management Science,* 3(4), pp. 344-349.

Mtega, W. P.& Ronald, B. (2013). The State of Rural Information and Communication Services in Tanzania: A Meta-Analysis. *International Journal of Information,* 3(2), pp. 64-73.

Mugwisi, T. (2013). *The Information Needs and Challenges of Agricultural Researchers and Extension Workers in Zimbabwe.* Unpublished Doctoral Thesis, University of Zululand, South Africa.

Mukerji, M. (2008). Telecentres in Rural India: Emergence and a Typology. *The Electronic Journal of Information Systems in Developing Countries,* 35(5), pp. 1-13.

Naveed, M. A. & Anwar, M. A. (2013). Agricultural Information Needs of Pakistani Farmers. *Malaysian Journal of Library & Information Science,* 18(3), pp. 13-23.

Njeru, J. R. (2014). *Factors Influencing the use of Information Technology in Telecentres in the Rural Setting of Kiambu County, Kenya.*Unpublished Master Thesis, University of Nairobi, Kenya.

Nor, N. F. M., Razak, N. A., & Malek, J. A. (2012). Telecentres as Training Centres of E-Learning for the Marginalized Community: The Malaysian Experience. *WSEAS Transactions on Information Science and Application,* 9(5), pp. 147-157.

Odhiambo, F., Harrison, J., & Hepworth, M. (2003). The Information Needs of Informal Carers: An Analysis of the Use of the Micro-Moment Time Line Interview. *Library and Information Research,* 27(86), pp. 19-29.

Okiki, O. C. (2011). *Information Literacy Skills as Factors Influencing Research Productivity of Academic Staff in Nigerian Federal Universities.*Paper presented

at the A PhD pre-field seminar presented at the department of Library, Archival and Information Studies, University of Ibadan, Nigeria.

Olukayode, O. M., Osman, W. R. S., Hussein, H. A., Ismael, A. N., Masoud, A. A., & Mansor, A. G. (2014). Rural Small and Medium Enterprise: Information and Communication Technology as Panacea. *IOSR Journal of Computer Engineering (IOSR-JCE),* 16(3), pp. 28-31.

Omar, S. Z., Shaffril, H. A. M., Bolong, J., & D'Silva, J. L. (2012). Investigating Rural Library Usage among Rural Youth in Malaysia: Its Corresponding Determinants and Impacts. *Computer and Information Science,* 5(2), p 98.

Omoregbee, F. & Banmeke, T. (2014). Information Needs of Cassava Farmers in Delta State of Nigeria. *Tanzania Journal of Agricultural Sciences,* 12(2), pp. 20-25.

Peffers, K., Gengler, C. E., & Tuunanen, T. (2003). Extending Critical Success Factors Methodology to Facilitate Broadly Participative Information Systems Planning. *Journal of Management Information Systems,* 20(1), pp. 51-85.

Ramli, S. A., Samah, B. A., Hassan, M. S., Omar, S. Z., Bolong, J., & Shaffri, H. A. M. (2015). Potential Benefits of ICT for Youth Agro-Based Entrepreneurs in Malaysia. *Journal of Applied Sciences,* 15(3), pp. 411-414.

Rao, S. S. (2004). Role of ICTs in India's Rural Community Information Systems. *Journal of Information System,* 6(4), PP. 261-269.

Razak, N. A. & Malek, J. A. (2008). *Bridging Digital Divide in Malaysia: Cyber Learning for the Marginalized Community*. Paper Presented at the Proceedings of the Distance Learning and the Internet Conference, Tokyo: Waseda University, pp. 235-239.

Reilly, K.& Gómez, R. (2001). Comparing Approaches: Telecentre Evaluation Experiences in Asia and Latin America. *The Electronic Journal of Information Systems in Developing Countries,* 4(3), pp. 1-17.

Reitsamer, B. F., Kaschig, A., Heinz, T. D., & Sauer, N. E. (2014). *The Effects of Website Quality Perception on Users' Responses–A Multidisciplinary Approach*. Paper presented at the Proceedings of the Twentieth Americas Conference on Information Systems, Savannah, 2014, pp. 1-12.

Roman, R.& Colle, R. (2002). *Themes and Issues in Telecentre Sustainability*. Institute for Development Policy and Management, University of Manchester, UK. Paper no. 10.

Roscoe, J. T. (1975). *Fundamental Research Statistics for the Behavioral Sciences.*2nd ed, Rinehart and Winston, New York, NY.

Salih, A. K. (2012). *Design Web-Based of Hajj Registration System for Iraq.* Unpublish Masrer Thesis, Universiti Utara Malaysia, Malaysia.

Salman, A., & Hasim, M. S. (2009). Sustainability of Internet Usage: A Study among Malay Women in a Sub-Urban Setting in Malaysia. *Haitian Research Journal on Development Studies (HRJS)* 12(2), pp. 433-447.

Samsuddin, S. F., Bolong, J., Omar, S. Z., D'Silva, J. L., Sahharon, H., & Shaffril, H. A. M. (2015). Examining the Impact of Demographic Factors on the Attitude of Rural Communities in Malaysia Towards Village WiFi Services. *Asian Social Science*, 11(18), pp. 134-143.

Sánchez, V. B., Ruiz, M. D. P. M., & Zarco, A. I. J. (2007). Drivers, Benefits and Challenges of ICT Adoption by Small and Medium Sized Enterprises (SMEs): A Literature Review. *Problems and Perspectives in Management*, 5(1), pp. 103-114.

Savolainen, R. (1995). Everyday Life Information Seeking: Approaching Information Seeking in the Context of "Way of Life". *Library & Information Science Research*, 17(3), pp. 259-294.

Savolainen, R. (2007). Information Behavior and Information Practice: Reviewing the "Umbrella Concepts" of Information-Seeking Studies1. *The Library*, 77(2), pp. 109-127.

Shaifuddin, N., Ahmad, M., Mokhtar, W., & Haliza, W. N. (2009). Information Seeking Behaviour of Rural Youth in Selangor. Project Paper, University Technology, MARA, pp. 1-13.

Sharma, A. K. (2014). Information Needs of the Farmers in Madhya Pradesh: A Study Ashish Kumar Sharma. *International Journal of Information Dissemination and Technology*, 4(2), pp. 135-140.

Silva, H. D. & Ratnadiwakara, D. (2008). Using ICT to Reduce Transaction Costs in Agriculture through Better Communication: A Case-Study from Sri Lanka. LIRNEasia Colombo, Sri Lanka. Available: http://ifap-is-observatory.ittk.hu/taxonomy/term/97?page=4. Accessed: 2 July 2015.

Wilson, T. D. (1999). Models in Information Behaviour Research. *Journal of Documentation,* 55(3), pp. 249-270.

Xue, S. (2005). Internet Policy and Diffusion in China, Malaysia and Singapore. *Journal of Information Science,* 31(3), pp. 238-250.

Zahurin, M. A., Affendi, S. A. M., Osman, W. R. S., & Yusop, N. I. (2010). A Conceptual Model for Psychological Empowerment of Telecentre Users. *Computer and Information Science,* 3(3), PP. 71-79.

Zahurin, M. A. (2014). An Investigation on Individual Empowerment of Telecentres Users: A Case Study of Three Pusat Internet Desa (PIDs) in Northern States of Malaysia. Doctoral Thesis, Universiti Utara Malaysia, Malaysia.